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EXCAVATING ENGINEER

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TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

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Vol. 28 — MARCH, 1934 — No. 3

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Progress on International Pan-American Highway.
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Good Mixers.
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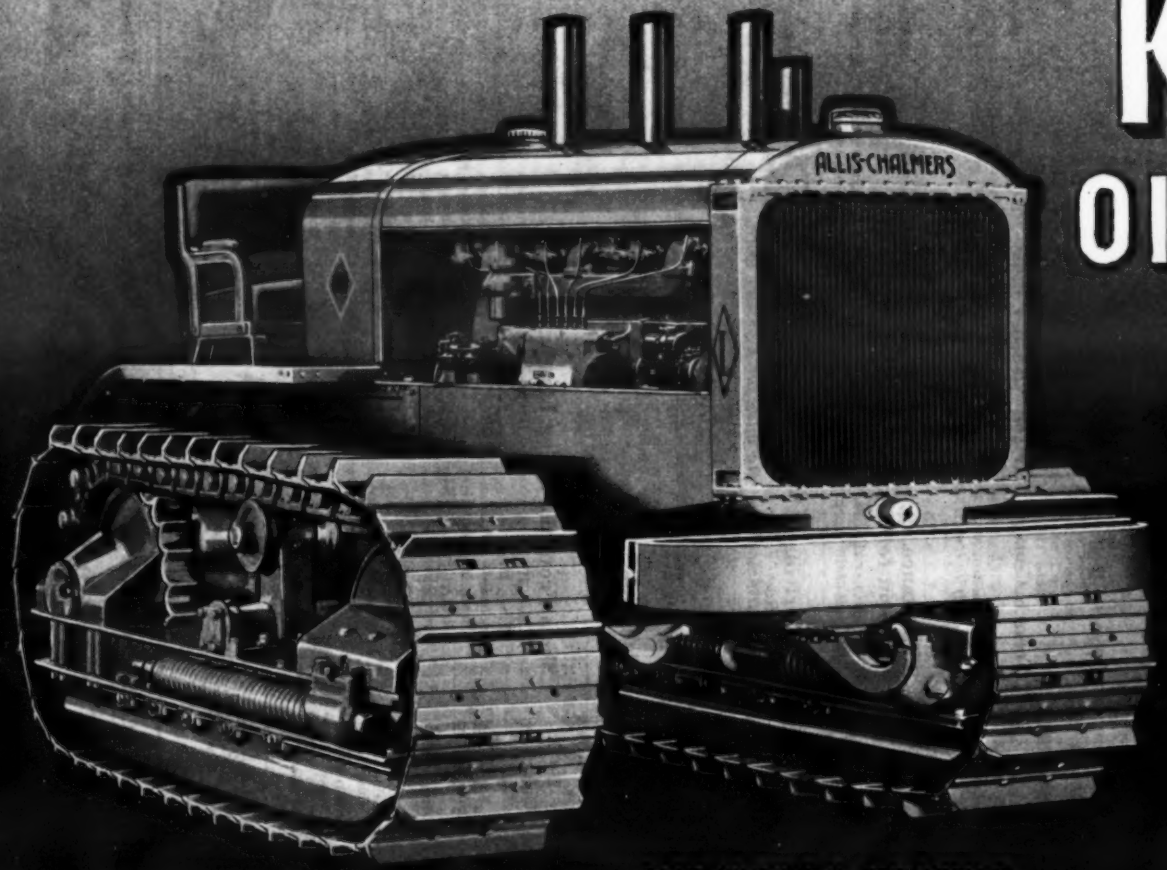
F. O. WYSE, *Managing Editor* — **ARNOLD ANDREWS**, *Editor* — **E. M. HEUSTON**, *Advertising Manager*

ANNOUNCING the New models "KO" AND "LO" OIL TRACTORS



THE "LO" OIL TRACTOR

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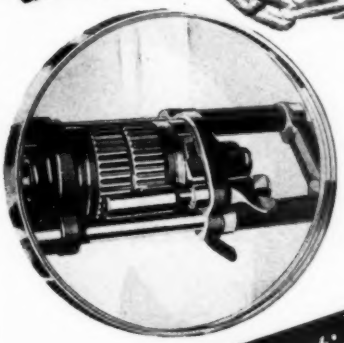
-after years of being Chained to a hand cranked drill!

AUTO FEED

DRIFTER DRILLS



An operator's report to his boss on the Auto Feed

NOW I can do more work . . . I just turn on the air and the Auto Feed does the cranking . . . and I don't have to have extra back end clearance to save my knuckles.

I can put all holes on the *neat* line . . . After the blast the job looks clean cut and smooth . . . *I'm not tied to the machine any more* . . . Starting holes is easy.

The Auto Feed gives me a chance to pick out my next steel . . . Get ready for the next hole . . . Clean up for the bottom holes . . . Adjust the clamp or jaw bolts in fitchery ground or tighten up the arm or bar.

You can't stick the steel . . . The more the ground pinches the better the Auto Feed likes it . . . The end of the shift finds me less tired, and I can turn in more footage per shift with less effort and at less cost.

Completely Automatic

No Crank

No Extra Air

No Extra Hose

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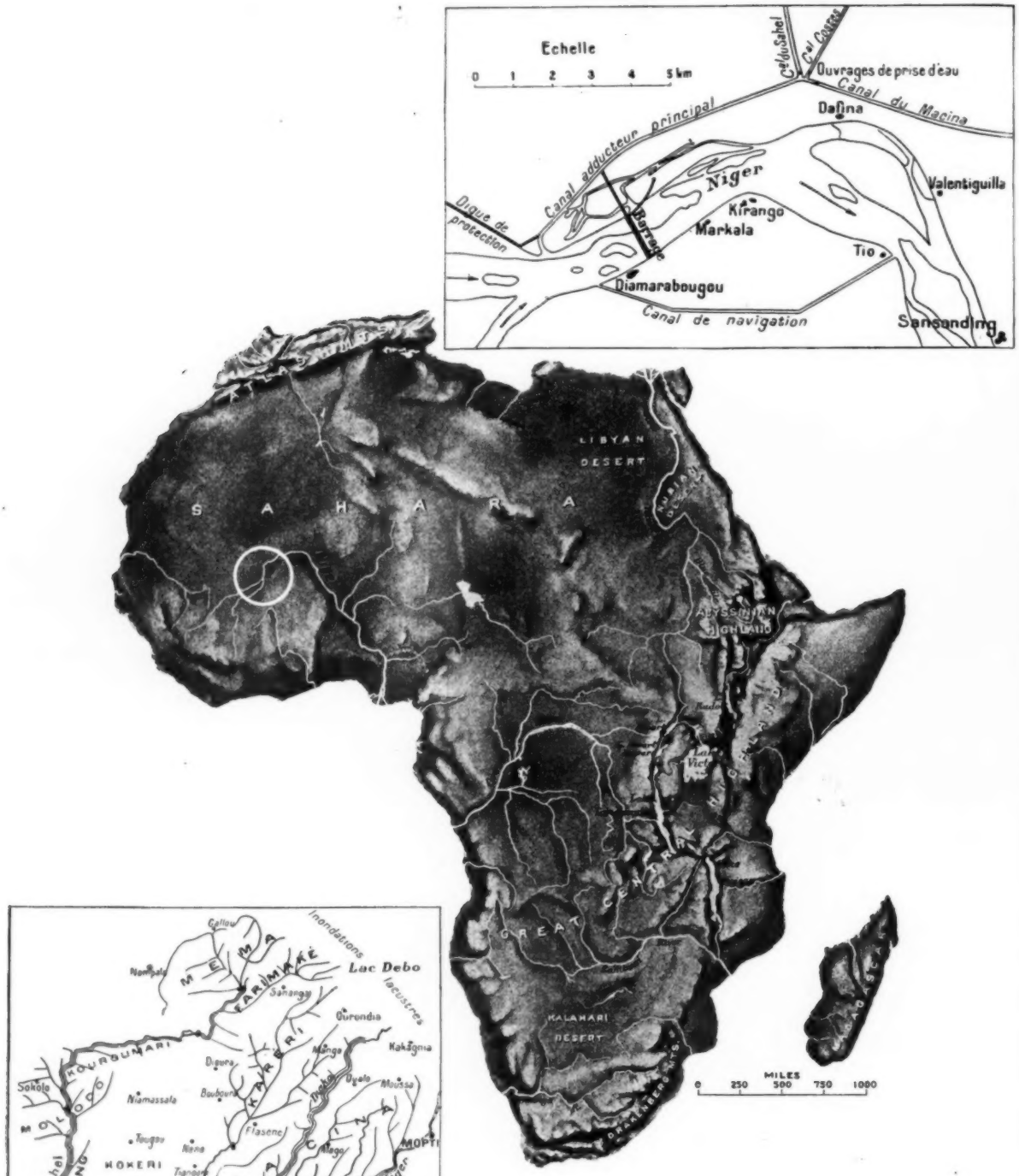

The above relief map of Africa shows the approximate location of the S.T.I.N. activities along the Niger. The smaller map at the bottom shows the canal system barrage and the cities and villages in the locality. In the upper right is a detailed map on a still larger scale of the barrage and the outlet canals.

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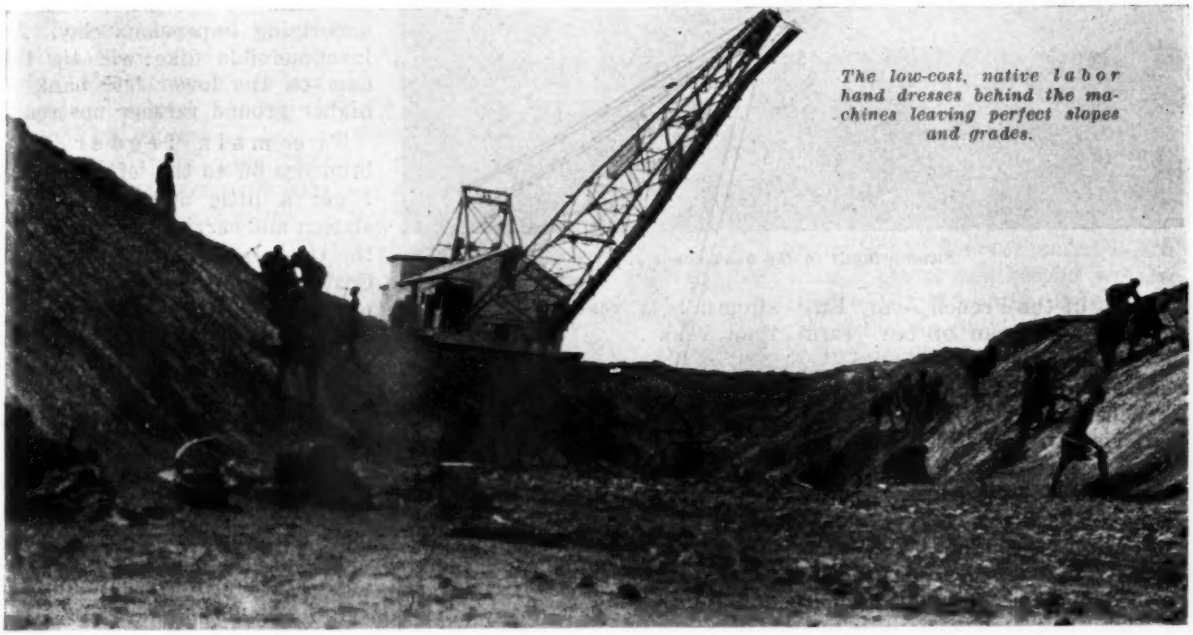


The low-cost, native labor hand dresses behind the machines leaving perfect slopes and grades.

French Convert African "Bush Lands" into Fertile Farms

S.T.I.N. digs canals and builds levees on gigantic project in Sudan which will reclaim over million and a quarter acres for agriculture and grazing.

ALONG the Niger River in French West Africa, about half way between Bamako and Timbuktu, Service des Travaux d' Irrigation du Niger*, better known as S.T.I.N., is digging canals and building levees to convert the "Bush Country" of swamp and waste land into productive farmlands.

S.T.I.N. is a department of the General Government of French West Africa, Colony of Sudan, under the Temporary Department of the Irrigation of the Niger and is staffed from the engineering corps of the French army. The headquarters in Africa, formerly at Bamako capital of French Sudan, are now located at Segou. Project offices and shops are located about 25 miles down the Niger from Segou at Markala from which point the operations spread out fanwise over the Niger's central delta. Here has been built up a small industrial city with good sanitation, shipping facilities, storehouses, shops, water system, lighting plant, hospital, offices and dwellings, suitable to service the job through the many years required for its completion.

*Department of Irrigation Works of the Niger.

"Central Nigerian Delta" Some 950 Miles Inland

The project was undertaken under the energetic initiative of Monsieur Belime, who has since become general director of the "Office of the Niger." In charge of the operations is Colonel

Swamp lands in the bush country.

Doizelet of the French Army Engineers, a veteran of ten years service in this part of Africa.

Hydraulic developments by the French have been carried forward in two regions along the Niger. Since 1929 the plain of Baguineda, downstream from Bamako, has been receiving Niger water through the Sotuba Canal. The operations herein described are northwest of Segou in the "Central Nigerian Delta" generally referred to as the Macina region. This inland delta, some 1,500 miles by river from the mouth of the Niger in Nigeria, spreads out fanwise from Markala to Lake Debo, the main channel of the Niger forming the southeastern boundary, and the old bed, Sahelian Niger, running along the northwestern side. The delta carries a gentle slope toward the northwest, the surface being broken by numerous old channels which, at flood time, carry a considerable volume of water but are dry during most of the year. The irrigation plan will utilize these old channels as irrigation canals, control the flood waters, store it for use throughout the long growing season, distribute it through the main canals, feeders, distributors and watering ditches. The excess water will be returned to the main channels, carried on to the lower areas and then on to Lake Debo which, during low water stages, is a vast swamp rather than a lake.

Control Dam Presents Unusual Features

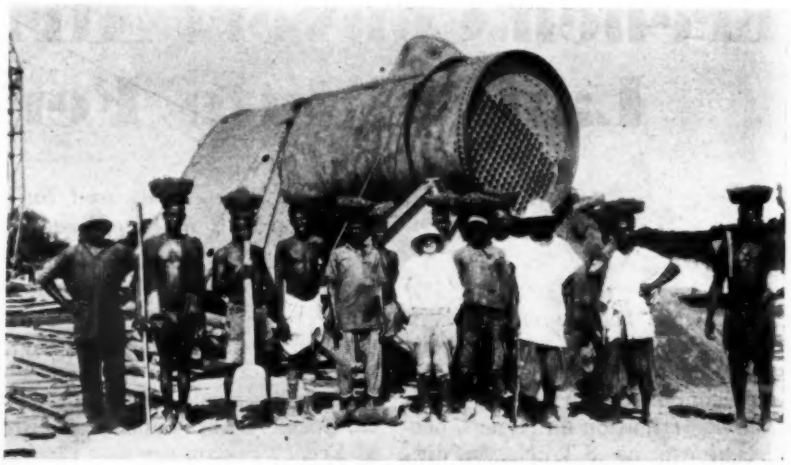
A control dam will be built at Markala, a little up stream from Sansanding and to be known as the Sansanding Dam. This will raise the low water head some 16 to 20 feet.

This dam, carrying movable "Flashboards", 935 meters (3050 feet) in length, will consist of 16 central sections of 55 meters (180 feet) each. Because the sections toward the west bank lay over a bed of sand some 33 feet deep (the remaining bottom being quite compact sub-soil) a semi-floating type of dam is to be used similar to those successfully built on the Nile in Egypt and on the Sukkur in India. A thick floor slab of considerable length is laid directly on the bottom with a curtain of sheet piling driven below this slab immediately upstream from the sluicegates and reaching down to the underlying impervious clay. An insubmersible dike will tie the dam on the lower left bank to higher ground farther upstream.

The main feeder canal branches off to the left from the Niger a little over a mile upstream and carries the water into the three main canals, the Sahel, Costes and Macina. It provides a cross-current take-off around a spur protected by rubble so that the heaviest silt will be deposited before entering the canal. The maximum flow is estimated for the future at 750 cubic meters or more per second but at the start there will only be need for some 300 cubic meters per second.

342 Miles of Levees Required

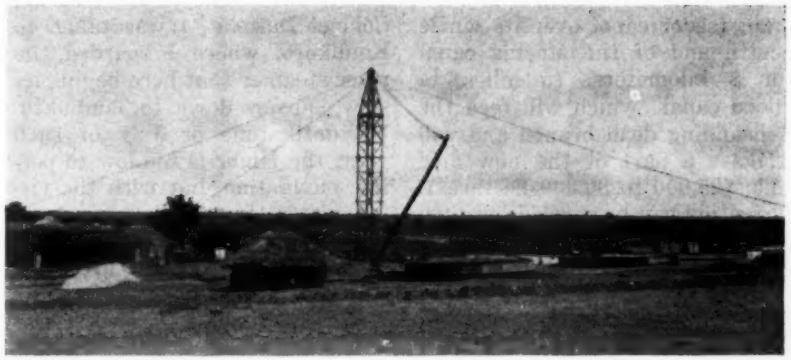
Before all these works can be successfully carried out, however, the delta must be protected from the overflows by dikes or levees. This levee system starts from the flank of the Sansanding Dam and follows more or less closely the left bank of the Niger to Diafarabe where it joins the



Loads are carried on the heads. This is a group of native laborers, with Mrs. Fenner in the center, posed before the big boiler which was raised by piling dirt and pieces of wood underneath it.

dikes of the Diaka channel, then continues on to and beyond Mopti. The crown of this main dike is 10 meters (32.8 feet) wide and is carried at an elevation about 3 feet above that of the highest known flood (1925). The top is used as a roadway for automobile and truck traffic in connection with servicing the project. The old arms of the Niger likewise need levees in certain parts. Altogether there are in the neighborhood of 550 kilometers (342 miles) of levees to be built requiring some 19,000,000 cubic meters (25,000,000 cubic yards) of excavation. Additional excavation required for the main canals totals some 12,000,000 cubic meters (15,700,000 cubic yards), and the grand total of all excavation for the entire project will probably run well over 35,000,000 cubic meters (46,000,000 cubic yards).

The maximum flow of the Sahel canal, at the intake will be some 375 cubic meters per second; though 135 cubic meters per second will be sufficient at the beginning. The Costes canal is much smaller (24 cubic meters per second). The Macina canal, artificial for its first five miles and then constituted by the dead arm of the Niger known as the Sansanding arm, will run alongside the river to beyond Diafarabe. At Kolongo, a spillway will return to the Niger any water left over. This canal will be navigable, and its intake



Shops and crane at Kayo where the Bucyrus-Monighan machines were erected.

These African natives, known as Bumbaras, are typical of the labor used in connection with this great excavating project in French Sudan. Their front teeth are filed to a point and they have great scars on their backs caused from gashes inflicted during ceremonial dances. Scars and symbolical markings are carried on their faces, arms and chests.

Riveting base of a Bucyrus-Monighan dragline. Note the costumes of the native laborers. These ranged from the primitive G-string to the most elaborate collection of miscellaneous garments which the owner could accumulate.

structure will consist of a lock 8x50 meters in size. The maximum intake flow estimated at 415 cubic meters per second will be limited to 150 cubic meters per second in the first stage.

In addition, a five-mile navigation canal will be established on the right bank of the Niger leaving the river about two-thirds mile upstream from the control dam, and rejoining it near Sansanding. This will be 20 meters (65.6 feet) wide and will be provided with a lock, 10 meters (32.8 feet) wide at each end.

300 Million Francs Appropriated for Preliminary Stages of Development

It is difficult at present to say with any exactness how long the complete realization of this development program will take. The first stage is to include, after the construction of the control dam and its accessory works, the development of the Macina lands in irrigated crops, then that of the Sansanding, Kouroumari and Mema areas. For this the French Colonial Government has appropriated 300,000,000 francs.

The first operations form a unit which the Office of the Niger calls the borrow program. They are to be completed in eight years at the maximum: the Sansanding dam and its secondary structures, the diking of the left bank of the Niger, the main feeder canal (for only a part of its ultimate width), the Macina, the Costes and the Sahel canals. At the present time the S.T.I.N. has already accomplished, through a preliminary development of the

main feeder canal over its whole length and of the Macina canal for 8 kilometers, (5 miles) a "flood canal" which will feed the Sansanding dead branch and will irrigate a part of the now arid soils (25,000 to 30,000 hectares). Irrigation can be carried out during a period of 3 months with a maximum toward the first of October, when the Niger is in flood, since the future control dam is not yet in condition to fulfill its storage service during the low water periods.

View of one of the canals giving some idea of the proportions. Note the accurate slopes.

First Bucyrus-Monighan Walking Dragline Installed in 1927

Preliminary construction started in 1927 when a Bucyrus-Monighan Walking Dragline carrying a 55-foot boom and 2½-yard bucket was erected at Kayo, a native village, after a long journey from the factory by rail to New York, steamer to Dakar, narrow gauge railroad to Koulikoro and then down the Niger by barges to Kayo. The machine is steam powered with a wood-burning boiler, wood being the most conveniently accessible fuel.

George Fenner, the Bucyrus-Monighan erector has an interesting story to tell regarding his experiences in setting up the machine. Says, Mr. Fenner:

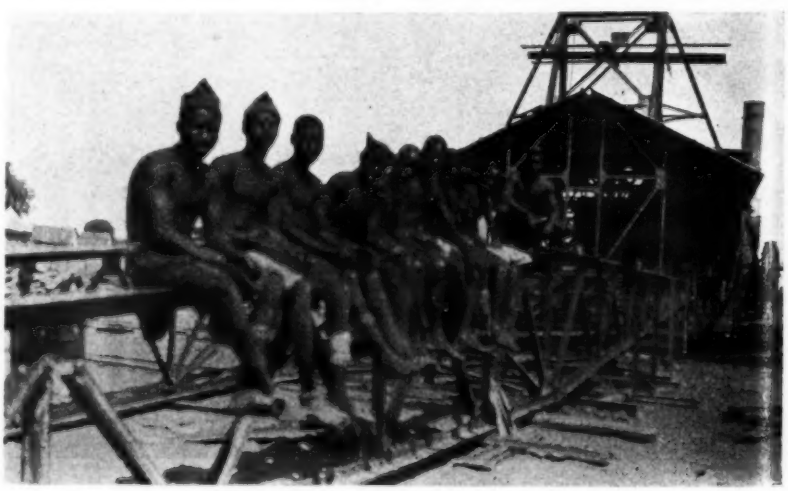
"Going to erect and start the machine, I disembarked at Dakar, and proceeded to Bamako by railroad. Upon reaching Bamako, and staying the night with Colonel Doizelet, I was taken to Koulikoro, where I boarded the river steamer that here begins its slow journey down to Timbuktu. Up until June or July of each year, the Niger is too low to permit navigation, but with the rising water, commerce begins and many supplies are carried and hundreds of natives are passengers on the lower deck of the steamer and in the shallow flat bottom barges in tow. The steamer is a wood-burner, and many stops are made enroute for fuel. During these stops natives from the surrounding country come to visit their fellows who are traveling aboard the steamer, and perhaps, to wonder at what they see and hear.

"After two nights and days, aided by the swift current in the rising Niger, our boat came to a stop. It was about two o'clock in the morning and the warm night air was filled with the hum of millions of mosquitoes and other insects. A native came aboard the steamer, took my baggage, and I was instructed to follow him. I was shown a comfortable bed with mosquito netting enclosing it in a very fine bungalow, and here I spent the remainder of the night. The next morning I met Mr. Deslandes, and learned from him that the place thereabouts was called Sama. From here, at nine that morning, I was taken by piroque, a great canoe hollowed by the natives from a log with fire and hatchet and with seams sewed together with reed. Eight native men paddled, keeping time with quick strokes of small heart-shaped paddles, to a monotonous tune they chanted. A native woman cooked her meal in the bottom of the piroque on a small fire built upon a flat stone.

Natives Purchase Choice Wives for Four Dollars Each

"At three o'clock that afternoon we arrived at Kayo, where the machine was to be erected. Here were six white men, the first to begin work on the levees in that part of the Sudan. Captain Louis Durant, Adjutant Gustave Reynaud, and Raymond Mathe were among these.

"The packages containing the dismantled excavator were un-



Crew of native laborers who erected the Bucyrus-Monighan 4-W.

The long reach of Bucyrus-Monighans make them particularly adaptable to this type of work.

loaded with the aid of native labor. The people known as Bumbaras, are, as a whole of gentle disposition. Many of the men had their front teeth filed to a point and I noticed great scars on their backs. These scars, I later learned, were caused from gashes inflicted one to another during ceremonial dances. Besides, all had ornamental scars and symbolical markings on their faces, arms and chests. These men were older than those I was to meet during my two subsequent visits to the Sudan. I was told, that as a general rule, the older men have many wives—at least as many as they can afford,—and that the price of a wife may be a goat or some other article equivalent in value to not over four United States dollars.

"The excavator parts were hauled to a large baobab tree which was to serve as a mast for our derrick. For a boom for the derrick, we decided to use the trunk of a cocoanut palm tree, because of this particular wood's strength and ability to bend to a considerable degree before breaking. If excessively stressed, a pole of cocoanut palm gives off a crackling sound, which would serve as a warning, so that the load being carried could be lowered before a crash occurred. The men had to go quite a distance before a suitable tree was found, but after three days they brought in a fine specimen. The tree trunk was carried from where it was found to the erection site by 60 men, four to each of 15 poles lashed crosswise of it. Its transportation was a difficult task, because of the dense underbrush.

To give some idea of the size of the 4½-yard dipper, Mrs. Fenner posed for the camera man. Note the native laundry and bath tub in the background at the right.

"During the building of the machine, an imaginative chief of the workers explained to the men that it was a giant cannon that exploded with a deafening roar. This frightened them, and before they would again come near the machine it was necessary to convince them of the true purpose of the excavator.

Dogs and Mice Delicacies for Native Laborers

"On the work there was a power-driven circular-saw, and with wonder the natives would watch it cut up poles that were brought in for firewood. Never before had these people seen modern tools, but they soon learned to use them. After the machine was put in operation, they were taught to fire the boiler, to oil the machine, and to operate it.

"One day I accused a husky native of shirking in his work.

(Continued on Page 130)

IMPORTANCE of ... in the Design of Electrical ...

WITH the use of increased power and heavier and sturdier equipment on power excavating machinery, there is also a tendency to make the complete machine more compact. At the same time, improved accessibility is constantly being sought. In order to progress along these somewhat dissonant lines, it is necessary to give increasing attention and thought to designing electrical equipment for minimum space requirements.

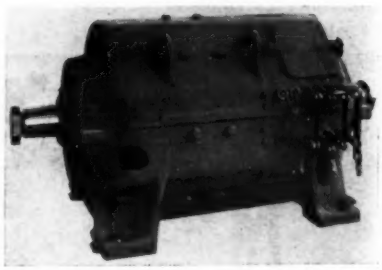
It has long been recognized that the many exacting requirements, which must be met in designing electrical equipment for shovels, demand special designs of motors, generators and control equipment. The necessity for extreme reliability and durability receives first consideration as these are the characteristics with

Control cabinet for ¼ cu.-yd. shovel.

which the user is most concerned and on which successful operation is primarily based. There is, however, a very definite trend toward incorporating extreme compactness among the special features required for shovel service. At first thought it may appear that the ultimate user is not particularly interested in the space requirements of the electrical equipment and that these will be of interest only to the shovel builder. Upon further consideration of the point, however, it becomes apparent that this is an important characteristic, not only for its direct value in the construction of the machine, but also because of its bearing on many of the other qualities of the excavator.

The user is interested in a design which will be sturdy and reliable and which will provide complete accessibility for inspection and replacement of such parts as may require attention during the life of the machine. In addition the user will be pleased to have a machine which can be kept clean and orderly without great effort. A neat arrangement of all of the equipment in the shovel cab, with plenty of passageway and inspection space provided, will give those in charge of the equipment an incentive for keeping it in good condition and free from accumulations of parts and rubbish of various kinds. On the other hand a machine whose interior arrangement, even as it leaves the factory, gives one the impression of a jungle of machinery, seems to invite carelessness and inattention in regard to its general maintenance.

The requirements of the shovel builder in regard to the electrical equipment, will be more exacting than those of the ultimate user. In addition to passing on, in amplified form, the requirements of the ultimate user, the builder will add a number of requirements of his own. There will be certain overall dimensions and general characteristics which are fairly well established by the rating of the machine and the general design of the shovel structure. The primary function of the shovel structure is to provide the basis for an excavating machine—its function of carrying the electrical equipment is of a secondary nature. Therefore, the electrical equipment must more or less accommodate itself to the available structure rather than the structure being built to accommodate the electrical equipment, as is usually the case in the ordinary industrial installation. In addition, there is the requirement in regard to shipping dimensions, particularly with regard to the smaller shovels which are shipped as a complete unit with all of the equipment permanently mounted in place. It should be possible to assemble the various parts in a preliminary way at the factory and to readily dissasemble these, and finally, to make a good permanent installation in the field with a minimum amount of construction work. Price must be a minimum consistent with the high quality demanded in the equipment. The design must be such as to permit the spare parts problem to be taken care of without undue capital tie-up or an elaborate bookkeeping system. It can be readily understood that compact design, if carried far enough, will take care of the first two of these points. Great care must be exercised in compacting the design or the price and spare parts aspects of the problem will be jeopardized.



Direct current mill type motor for shovel service. Bottom half magnet frame ventilated and top half enclosed protected.

The builder of the electrical parts is concerned with producing an equipment of ample speed—torque characteristics and extreme reliability, at the same

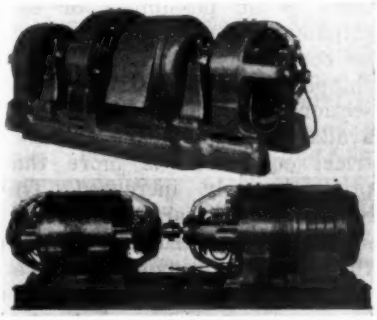
By D. STOETZEL

Industrial Engineering Dept., General Electric Co.

Space Requirements Equipment for Shovels

time fully meeting all of the requirements of both shovel builder and ultimate user.

While there may at times appear to be some incompatibility in the viewpoints of the three classes mentioned above, it will be found in the final analysis, that they all have the same objective, namely, to produce the best possible equipment for the service conditions in question at



Above—Four-unit, four-bearing induction motor driven motor-generator set for 2 cubic-yard shovel. Below—Four-unit, two-bearing induction motor driven motor-generator set for 3-cu.-yd. shovel.

a minimum expenditure. The question of low weight has never been important inasmuch as it is practically always necessary to balance or counterweight the rear of the shovel with iron punchings or bars. While it has been necessary in many cases to go to extreme measures in designing the electrical equipment to make it sufficiently compact to fit in the limited space available on the machine, this has never been accomplished at the sacrifice of sturdiness and reliability. Occasionally minor concessions have had to be made in the line of decreased accessibility, but, in general, accessibility for adjustments and repairs has been constantly improved.

A more detailed consideration of present standard shovel equipment reveals many points illustrating how the objective has been accomplished. To this end, we may roughly divide the usual Ward Leonard voltage control shovel equipment into four major groups: D-C. motors, D-C. control equipment, motor-generator set and A-C. control equipment.

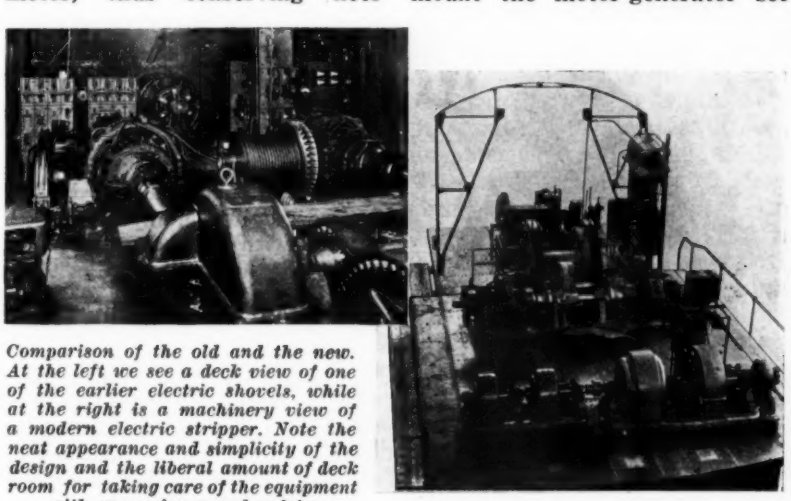
The D-C. motors are of the type employed for steel mill service. It has been found desirable to use roller bearings in all cases and to modify the standard steel mill dimensions to the extent of taking advantage of the roller-bearing construction to decrease the original overall length by a substantial amount. This gives us the so-called shovel type of steel mill motor.

By using an external blower and forced ventilation it is possible to get a considerable increase in the output or continuous rating of a motor of this kind. This means that by the use of this method of machine ventilation the required power can be obtained in a smaller space than with the ordinary design. In many cases, forced ventilation makes it possible to use the next smaller size of D-C. motor for a given shovel drive. The use of separately ventilated motors has become quite general, particularly for the hoist motion and on the larger sizes of shovels. Blower equipment is conveniently and accessibly mounted on top of the main motor, thus conserving floor space and at the same time locating the air intake in a comparatively clean place.

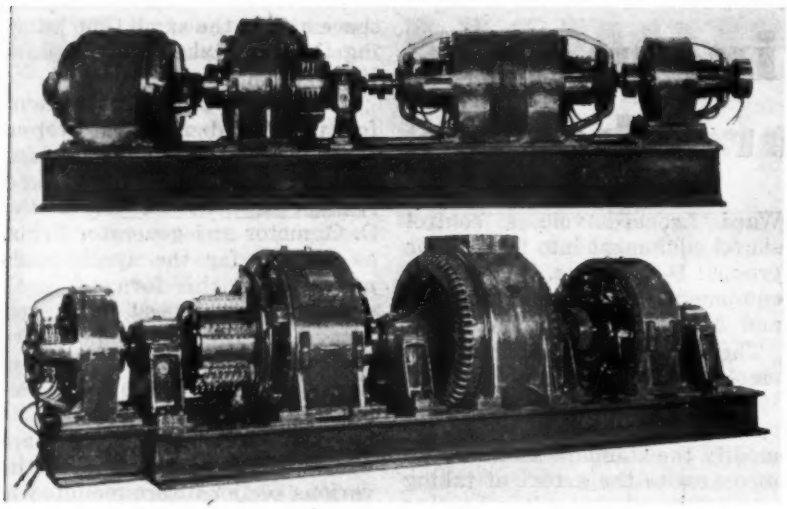
The D. C. control equipment for the Ward Leonard system consists of field controllers for each of the various motions and resistor sections for all of the D. C. motor and generator fields, as well as for the synchronous motor where this form of A. C. driving motor is used on the set. Altogether, there are some twelve to fifteen different resistor sections. These have all been combined in one resistor frame, thereby saving a great deal of space which would be required if the various sections were mounted in individual frames, as well as improving accessibility, reducing the price of the resistor and expense of installation and making a neater and more substantial appearing job.

Because of the large number of circuits to be handled, controllers were originally of the double row of fingers type. This construction requires considerably more floor space than the single-row-of-fingers type and a redesing to the latter was therefore effected. Sixteen or eighteen fingers are required and in this redesign care had to be taken to keep the overall height of the controllers low enough so as not to interfere with the operator's view of the work.

Probably the greatest amount of attention has been devoted to the design of the motor-generator sets. The usual practice is to mount the motor-generator set



Comparison of the old and the new. At the left we see a deck view of one of the earlier electric shovels, while at the right is a machinery view of a modern electric stripper. Note the neat appearance and simplicity of the design and the liberal amount of deck room for taking care of the equipment with convenience and safety.



Below—Synchronous motor-generator set equipped with pedestal type bearings for 6 cu.-yd. dragline excavator. Above—1800 rpm. 5-unit, 6-bearing, motor-generator set for 4 cu-yd. shovel.

cross-wise in the shovel cab and at the extreme rear. This practice necessitates a length of set not to exceed the width of the upper frame of the shovel, i.e., the width of the cab. In all cases this requirement more or less restricts the design of the set as the width of the shovel structure is invariably kept at a minimum. The width of the shovel has a distinct bearing on swing clearance, an important point in regard to shovel operating characteristics. For the small and medium size machines it is desirable to keep the width of the shovel structure such that the complete upper frame assembly can be shipped as a unit on a flat car. To meet these conditions and with railroad clearances limited as they are at the present time, the overall length of the sets for shovels intended for unit shipment should not exceed 10 feet or 10 feet 2 inches, thus making it possible to ship the machine with the set mounted crosswise of the shovel cab.

Direct current mill type motor for shovel service, with auxiliary induction motor driven blower.

For smaller machines, this has been accomplished by mounting two armatures on a common shaft and using only two end shield type of bearing brackets to support the assembly. With this construction, a four-unit set has a total of four ball bearings and two shafts. The flexible coupling between the large and the small parts of the set is the shortest standard type available. Commutators and end brackets are designed for minimum length consistent with the heavy duty anticipated. Armature design tends toward large diameter - short stacking proportions.

Manual reduced-voltage starter for shovel motor-generator set.

For the larger sets as applied to intermediate size shovels a single shaft supported on two bearings is used to carry as a unit the rotating elements of all four machines, namely, the rotor of the driving motor and hoist, swing and crowd generator armatures. This is the so-called 4-unit-2 bearing construction, probably the shortest and most compact motor generator set construction ever devised for a semi-standard application. As in the case of the smaller sets, advantage is taken of every opportunity to make the individual machines, comprising the complete assembly, as short as possible. Ball bearing construction is used in practically all cases, inasmuch as this makes possible a considerable saving over the length required with sleeve bearing construction.

For the largest sizes of shovels, there is no possibility of unit shipment and the machine has to be completely disassembled and shipped in comparatively small sections. Furthermore the space available for mounting the electrical equipment is more than proportionately increased. This makes unnecessary any highly specialized construction to meet the space requirements. However, the general principle of generator construction and the elimination of bearings where possible is strictly maintained. For these larger generators caution must be observed in designing for a minimum number of bearings as the greatly increased weights of the machines, with comparatively high operating speeds, introduce tremendous increases in stresses, which tend to deflect shafts and overload bearings.

The latest development along the lines of saving length on motor-generator sets is the dual output generator design. It has been found possible to design a single unit generator which will have two independent and independently controllable outputs of equal capacity. By applying one of these circuits for swing motion service and one for crowd, a very convenient and logical use is made of this novel design. The dual output generator is larger and heavier than either of the machines it replaces but it can be appreciated that this elimination of one complete D. C. generator will go far toward reducing the overall length of the set. Present

(Continued on page 133)

PILE DRIVING in New Jersey Meadows Mud

Linde-Griffith Construction Company get fast work from their Bucyrus-Erie 42-B steamer handling both concrete and timber piles

By D. W. EVANS

THE marshes and soft ground that constitute many acres of the "meadow" land around Newark and Jersey City may some time be just a memory. At present they are the cause of a lot of extra work for the New Jersey State Highway Department. And the chances are that the Linde-Griffith Construction Company of Newark finds them an unmixed blessing, because soft ground is meat and drink to these pile-driving specialists.

The Holland Tunnel and the George Washington Bridge combined to increase traffic congestion in the State of New Jersey just west of New York City. The principal highway to relieve this congestion is the high-speed elevated viaduct crossing the New Jersey meadows from Newark to Jersey City. As a part of this project it was necessary to carry four highways over the yards and tracks of the Pennsylvania Railroad in Newark to join the new viaduct.

Linde-Griffith used this 42-B Bucyrus-Erie steamer with a 60-foot boom and 80-foot leads and equipped with a 9B2 McKiernan-Terry hammer to drive 510 piles totaling 29,500 feet.

Because of the soft ground conditions mentioned above, State highway engineers planned to use precast concrete piles as foundations for the piers carrying the four overhead structures. And that is where Linde-Griffith come in strong, because they secured the sub-contracts for driving the concrete piles on three out of the four jobs. The fourth was handled by Geo. B. Spearin, using a Bucyrus-Erie 41-B steamer.

100,000 feet of concrete piling

The concrete piles used on the Linde-Griffith sub-contracts were cast at the Massey Concrete Products Corporation plant in Newark. The piles were octagonal in shape, and varied from 16 to 30 feet in length. For the four jobs over 100,000 feet of piling was manufactured. It is believed that this is the first time concrete piles have ever been used on highway work.

Pile driving equipment owned by the Linde-Griffith Construction Company includes Bucyrus-Erie 42-B and 41-B steam cranes, and a dozen Land machines. All of the difficult work on these contracts was done by the 42-B machine.

Fifteen miles north of the Newark express highway, George M. Brewster & Sons of Bogota, New Jersey were awarded a highway job running from Ridgefield Park west to Hasbrouck Heights. While this does not connect directly with either of the two routes into New York it will serve as a cross-country link between the Ridge Route and the West Side Highway leading straight to the Holland Tunnel. 200 yards from the west end of the job the new highway will cross over the Erie Railroad on a reinforced concrete bridge 232 feet long, set at an angle to the tracks. To create a firm foundation the two abutments and three piers of the bridge are to be set on timber piles. Linde-Griffith moved their 42-B north from Newark, to handle this job.

Snaking a pile from the stock pile and hoisting it into place in the leads. A pile every 15 minutes is the schedule!

35 piles 58-feet long driven in eight hours

Specifications on the bridge foundations call for 510 piles averaging 58 feet in length, or a total of 29,500 lineal feet of driving for Operator Frank Smith. This may be some kind of a record for piling in New Jersey, but it's all in the day's work for Frank. His 42-B is equipped with a 60-foot boom and 80-foot rigid pile driver leads. Hung on the leads is a husky McKiernan-Terry 9-B-2 steam hammer. With the hoist line, he snakes a pile out of a stack alongside the tracks, and hoists it up into the leads. He swings the machine around, moves it forward a foot

(Continued on page 131)

French Convert African "Bush Lands" into Fertile Farms

(Continued from Page 125)

As a reason, he explained that he had had no dog meat to eat for some time, causing him to weaken. That night a native dog, attracted by a live chicken bait in a stockade trap set for large game, was caught. Within half an hour, the said dog was roasted and eaten, and so the men had partaken of their favorite food once more. The flesh of monkeys and mice also is relished, and I have seen many mice roasted in our rivet forge.

"When the machine was erected, it was walked for about two miles to continue building a levee that was started by men who broke loose the soil with picks and carried it on top of their heads in small grass baskets to the fill. This method of building was discontinued because of its slowness. The machine commenced working here and has since been working up-stream along the Niger."

A Second Bucyrus-Monighan Goes to Work in 1929

In 1929 a second Bucyrus-Monighan was purchased similar to the first one, which had given an excellent account of itself in building the levees. Again Erector Fenner traveled the trail toward Timbuktu and renewed his acquaintance with the fine group of French officers and mechanics who were here pushing the frontiers of France forward into their waste lands of Sudan. Using the same baobab tree (strengthened with a cable in the upper branches to offset some slight decay) and with a new cocoanut palm for a boom the second machine was erected by the native laborers. This home-made crane, by the way, was used to lift parts weighing as high as 13 tons.

When erected, the new Monighan walked out along the top of the hand and machine-built levee about four miles where it began work on its own account working downstream.

Experimental Farm Pioneers for Great Plantation to Follow

With both of these machines working 24 hours a day and making rapid progress in both directions from Kayo, specialists were summoned from France and with the aid of modern farm machinery, put to developing the section around Kayo where seasonal irrigation had been made available. Today this section presents an immense, well developed experimental farm where various kinds of rice, grains, cotton, fruits and vegetables are grown. Careful records of results are kept and samples of the products sent to France for analysis and study of market values. Where formerly there were but trails, a road has been cleared and during the dry seasons permits automobile travel from Bamako to Kayo, the crossing over the Niger being made by ferry-boat at Markala.

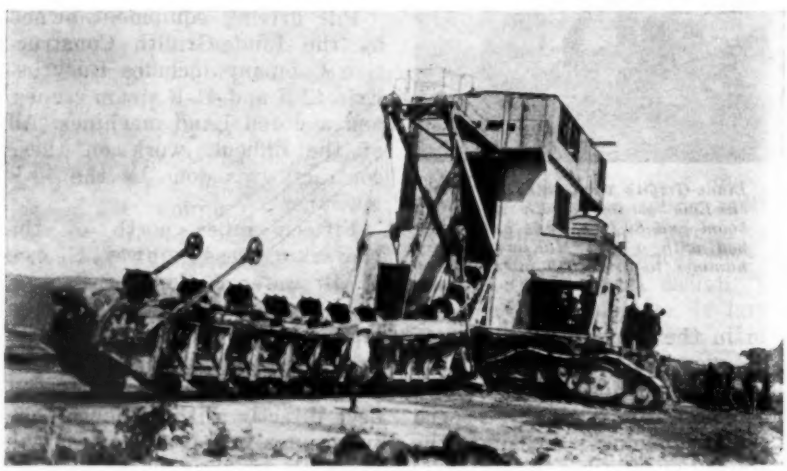
By the end of 1932 the first two Bucyrus - Monighans had built some 45 miles of levees which run about 12 feet in height in the low lying places and are 40 feet wide across the top.

Success of First Two Walking Draglines Leads to Purchase of a Third

They have been joined by a third and bigger Bucyrus-Monighan sent over in February, 1932 and operating out of a place known as Sarkala. This machine, a 4-W, is equipped with a 100-foot boom, 4-cubic yard bucket, and weighs some 230 tons. Like the others it is a steamer and carries a wood-burning boiler. When it is realized that because of limited transportation facilities and erecting equipment the machine had to be shipped, knocked down as far as possible, that it must be set up with hand tools and native labor, that field riveting had to be done with rivets heated over charcoal fires and the charcoal made right on the job, some idea of the experience and ingenuity required to put equipment of this size into successful operation in a location of this kind may be appreciated.

In telling about his third trip to the S.T.I.N. operations Erector Fenner comments:

"In the building of the 4-W, younger natives were employed, men who were unmarried. Some of their names were: Musa, who was the chief of the workers; Ogadu; Condyu; Bobo; and Billie Billie (which means "big" in the native dialect). All were honest and fearless workers and they never murmured at the hardest labor they were put to. Bobo sickened and was taken to the French doctor in the vicinity. Bobo's friend, Billie Billie, came often to our house and sat disconsolate on the floor. That he possessed the human virtue of compassion was evident, because he would inquire about Bobo's



German-built ladder-type excavator.

condition and hope for his early recovery. Ogadu, a serious minded fellow, who had walked for 14 days with his brother, Condyu, from his home in the Gold Coast to our location, said that if Bobo died, he (Bobo) would go where the white man went, as all people were the same under the skin."

When erection of the 4-W was complete she stepped off downstream, under Captain Durant's orders, building, as she goes, a wide canal to carry water for the irrigation of the great plantations that are being developed.

The excavating equipment on the job also includes two pivoting-bucket-ladder excavators of German manufacture. These are also used on the levee and canal building operations. They are steam driven (burning wood) and rated at 120 horsepower. Each weighs some 180 long tons. The toothed knives of their buckets scrap and drag the ground up, conveying it to a hopper through which it drops to a moving belt which carried the spoil off to the side. Each excavator is mounted on three caterpillars, two of which are power driven.

Excellent Production Records Made by Native Operators

During the 1931 working season (nine months) the two Bucyrus-Monighan 2½-yard draglines and the two German conveyor-excavators dug 5,760 meters (18,890 feet) of the main feeder canal and 7,200 meters (23,616 feet) of the Macina canal, to an average depth of 5 meters (16½ feet). The dike on the left bank of the Niger had been erected for 57.5 kilometers (36 miles) and that on the north bank of the Macina canal (width of which is only 6 meters—19¾ feet) for 4.5 kilometers (2.8 miles); this required about 585,000 cubic meters (765,180 cubic yards) of excavating and 1,690,000 cubic meters (2,210,520 cubic yards) of fill.

This 4-W Bucyrus-Monighan started work November 5th last after a two months shut down during the annual floods. In the first two weeks of operation it moved 42,000 cubic meters (54,936 cubic yards) in 245 working hours (or 170 cubic meters per hour . . . 222.4 cubic yards.)

During 1932 the same equipment built 43 k.m. (26.9 miles) of dike totaling 1,298,000 cubic meters or 1,697,784 cubic yards. In 1933* with the addition of the Bucyrus-Monighan 4-W and a French 2½-yard dragline, the six machines moved a total of 2,060,000 cubic meters or 2.694,480 cubic yards.

The very fine progress made under unusual and difficult conditions of operation testifies to the ability, cooperation and initiative of the entire executive staff of S.T.I.N.

*Exact results were only known at time of writing up to November 20th. Those from that date to December 31st have been estimated.

PILE DRIVING in New Jersey Meadows Mud

(Continued from Page 129)

or two, and spots the long stick exactly in the mud. As he lowers the hammer carefully onto the pile, it sinks ten feet into the mud. As he opens the throttle, the first dozen blows drive it twenty feet further. Then they really settle down to work. The soft ground shakes with each hammer blow. By the time the pile is nearly down, it takes three blows of the hammer to drive it in an inch. It is finally driven into place, and while the hammer is hoisted to the top of the leads again, the crane swings around to hook on the next pile.

In an eight-hour day, we learn that this 42-B drives 35 piles into place. There are 156 piles in each of the two abutments, and 66 apiece in the three piers. One abutment and two piers are finished, and a dozen more piles will complete the third pier. They are a little worried about the final abutment, because a 25-foot fill has been placed just west of it. With the ground shaking as the big hammer barks away, there might be a slide. Well, we wish them luck.

* * *

Since the above was written Linde-Griffith have finished up this job successfully and moved to another near Hasbrouck Heights where they are putting down 700 65-footers for foundations of an overpass adjoining the Brewster job. The work is being handled for Tidewater Stone and Supply Co., the general contractors.

In commenting on the bridge foundation job, William Brewster of George M. Brewster & Sons, general contractors, remarked to C. E. Ryan, Vice-president of Linde-Griffith organization, on the last day of driving:

"Ryan, I want to be frank with you. You have two good Frank's on the job, Frank Lethonen, the Foreman, and Frank Smith, the Engineer. In fact you have a cracker-jack crew and a great rig. I am well pleased with the way you handle your work."

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The Business Situation

DURING 1933 business activity improved, not only from the low point reached in March but from the rate of activity which existed at the beginning of the year. The violent increase that reached its peak in July subsided, as was natural, to a low at the beginning of November. Since that time we have experienced a healthy though more gradual gain . . . a much better state of affairs than a rapid rise which is so likely to beget fear and bring about severe reactions.

The new monetary policy of the administration has fostered confidence is the most potent factor in recovery.

As long as the fear of unsound money was prevalent and as long as there were grounds for that fear, it could not be expected that depression would be faced with that powerful antagonist—confidence. The devaluation of the dollar has certain drawbacks but the accompanying stabilization which is now the avowed object of the administration is doing and will do much toward generating the confidence which has been so badly needed during the past several years. The new low value dollar with its gold price of thirty-five dollars an ounce, instead of the old price of a little over twenty dollars, will probably have the effect of stimulating exports and restricting imports since, because of this dollar, the individual in the foreign country can buy from us at a lower price than he could before, while we must pay for what we buy abroad. The new value will unquestionably lift commodity prices in this country and by doing so will decrease the value of wages and salaries, but on the other hand, if it increases business activity, it will lighten the burden of old debts.

But the most important thing for the moment, perhaps, is the fact that the public thinks that the administration is planning the ultimate adoption of a sound money system and this has created confidence . . . so much so that we see, in some industries, activity reminiscent of 1929. We again see the question of delivery becoming an important consideration in major purchases. The unemployed man again discovers it is possible to find a job instead of only uncertain possibilities of the many "commission schemes" that have filled the "help-wanted" columns of our papers for the last few years.

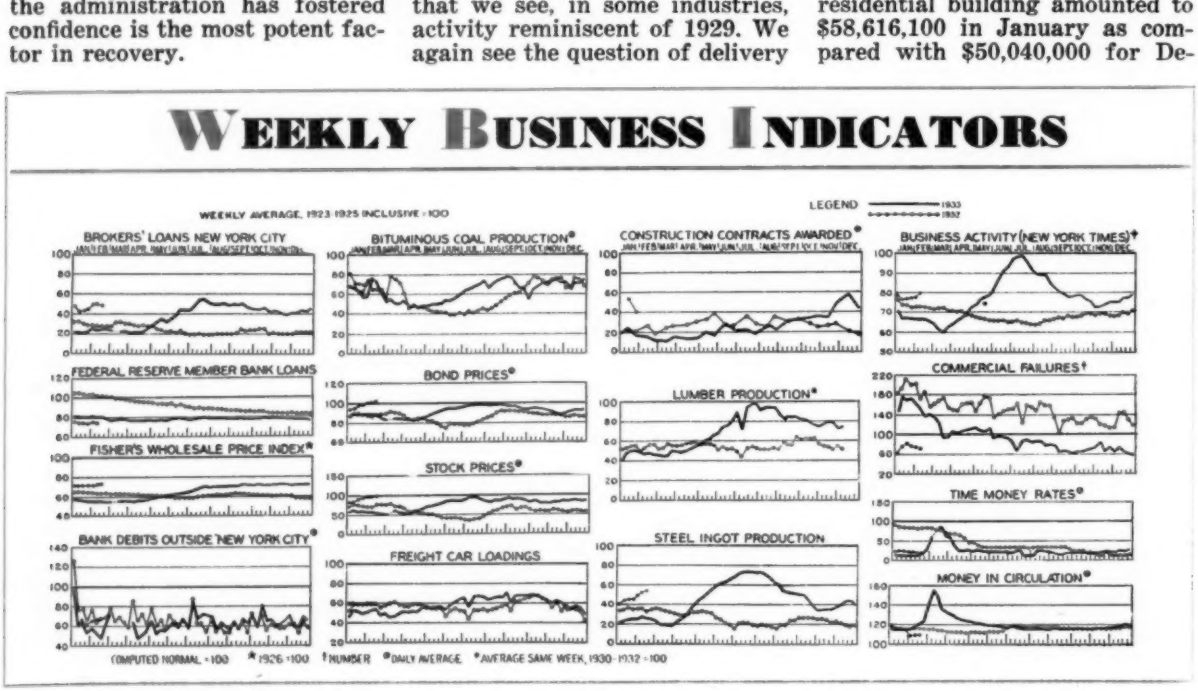
And in the construction industry we find the amount of work being done showing a healthy increase over the year before.

Contracts let during January showed a gain of over 100 per cent over January, 1933 according to *F. W. Dodge Corporation;* but the total of $187,463,700 was almost 10 per cent smaller than the contract volume for December which totaled $207,209,500. The current January total was only 5 per cent behind the volume for the entire first quarter of 1933; this discloses how great has been the relative improvement over the lethargic conditions of last year. In commenting on the outlook the Dodge bulletin observes:

'There can be little doubt that the contract volume for the initial quarter of 1934 will exceed $500 millions; this, in contrast with $196 millions for the corresponding quarter of 1933.'

January contracts for residential building totaled $15,110,400 as against $23,899,600 for December and only $11,950,900 for January, 1933. Awards for nonresidential building amounted to $58,616,100 in January as compared with $50,040,000 for De-

WEEKLY BUSINESS INDICATORS


WEEKLY AVERAGE, 1923-1925 INCLUSIVE = 100
LEGEND 1933 1932
BROKERS' LOANS NEW YORK CITY
BITUMINOUS COAL PRODUCTION*
CONSTRUCTION CONTRACTS AWARDED*
BUSINESS ACTIVITY (NEW YORK TIMES)†
FEDERAL RESERVE MEMBER BANK LOANS
BOND PRICES*
LUMBER PRODUCTION*
COMMERCIAL FAILURES†
FISHER'S WHOLESALE PRICE INDEX*
STOCK PRICES*
TIME MONEY RATES*
BANK DEBITS OUTSIDE NEW YORK CITY*
FREIGHT CAR LOADINGS
STEEL INGOT PRODUCTION
MONEY IN CIRCULATION*
COMPUTED NORMAL = 100 *1926 = 100 †NUMBER *DAILY AVERAGE *AVERAGE SAME WEEK, 1930-1932 = 100

cember and only $28,731,600 for January of last year. Public works contracts (of engineering types) awarded in January not only exceeded the totals for both comparative periods but were more than 60 per cent larger than those reported for the entire first quarter of 1933. Public utilities awards fell sharply from December but were maintained above the level of January, 1933.

January contracts for all classes of construction were larger than a year ago in each of the thirteen Dodge districts, except the Metropolitan New York Area, the New Orleans district, and Texas. The largest relative gains occurred in the Southeastern and Pittsburgh areas.

For residenial building alone gains over last year were reported in the Middle Atlantic, Southeastern, Southern Michigan, St. Louis, Kansas City and New Orleans districts; declines were shown in the remaining seven districts.

For non-residential building alone gains over January, 1933, centered in the New England, Middle Atlantic, Pittsburgh, Southeastern, Chicago, Central Northwestern, Southern Michigan, St. Louis, Kansas City and New Orleans territories; losses only were reported for the Metropolitan Area of New York, Upstate New York and Texas.

For public works (civil engineering projects) gains over a year ago were universal, except for declines in the New Orleans and Texas areas. For public utilities gains over last January were recorded in each district except Metropolitan New York and Kansas City territories.

Contemplated construction reported during January totaled $475,894,600 for the 37 eastern states; this compares with $778,030,600 for December and $101,843,300 for January of last year. Gains over a year ago in contemplated work were reported in each of the 13 districts except the Kansas City area where the decline was only nominal. Contemplated work reported in January for the 37 states totaled greater than the volume reported for the entire first quarter of 1933.

President Approves General Contracting Code

PRESIDENT Roosevelt on February 17th approved the code of fair competition for the General contracting division of the Construction Industry. This code establishes divisional code administration under the master code for the Construction Industry, and sets forth rules of fair practice and rules regarding the submission of bids. It is to become effective March 19, 1934. Of the economic effects of the code National Recovery Administrator Hugh S. Johnson wrote President Roosevelt as follows:

"Due to the magnitude of the General Contractors' Industry, and the mass of statistics relating to it, it is difficult to make an epitomization as to the economic effect of the code. Construction volume approached $11,500,000,000 in 1928, and direct employment in 1929 ranged from 3,200,000 to 3,400,000. It is safe to say that with the prohibition of unfair trade practices and the establishment of uniform rates of pay and hours of work under the construction code that more wholesome conditions will prevail in this industry and that employers, employees and the public will all be benefited."

Importance of Space Requirements in Electric Equipment for Shovels

(Continued from Page 128)

indications are that this design will be more or less generally used for all shovel sets except the very largest sizes. The saving in length made possible by this development has been used to offset the increase in length necessitated by using 1800 rpm. machines instead of 1200 rpm. machines.

Originally, considerations of sturdiness and reliability dictated that all Ward Leonard shovel generator sets be designed for a speed of not over 1200 rpm. For larger shovels this speed is still used. However, with improvements in mechanical design and greater background of field experience, it has been found possible to use 1800 rpm. sets for the smaller sizes, gradually working up to the intermediate size machines. The advantages of 1800 rpm. design are: (1.) Lower cost. (2.) Improved volt-ampere (power) characteristics from a given size of generator. (3.) Greater power from a given size A. C. driving motor. (4.) Simplification and standardization of number of designs to meet various conditions of power supply.

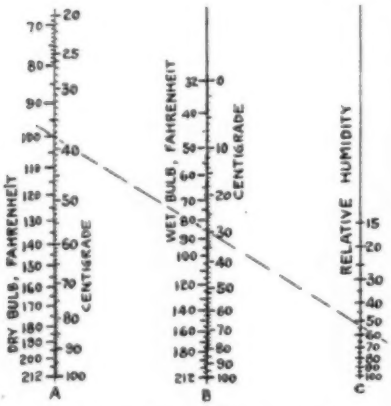
In explanation of this point it may be pointed out that the 1800 rpm. set is designed to give suitable output characteristics at either 1500 rpm. or 1800 rpm. (1500 rpm. being the speed of either 50 or 25 cycle driving motors). This makes it possible to take care of 25, 50 or 60 cycle installations with the same D. C. parts. Furthermore the A. C. driving motors are usually interchangeable so that a given set can be converted from one voltage or frequency to another without undue expense or delay.

The primary function of the A. C. control equipment is controlling the main motor generator set. Provision must also be made for controlling the exciter set, small power transformers, dipper trip motor, air compressor, brakes and lights. This control will consist of rheostats, fuses, switches, contactors, and relays. All of this equipment is usually grouped in a single compact assembly using angle iron and sheet steel cabinet construction. In this way a number of items of miscellaneous equipment and small parts are mounted out of the way in a place where they are protected against mechanical damage and also against interference or adjustment by unauthorized persons. At the same time, the total space required for the complete group is kept to a minimum by carefully locating all of the parts in the cabinet to the best possible space advantage consistent with accessibility for inspection and adjustment.

FIELD NOTES

What is the Relative Humidity?

HERE is a handy chart for quickly finding relative humidity. Tables and computations are unnecessary. Run a straight line through the dry bulb temperature, column A, and the wet bulb temperature, column B, and



the relative humidity is instantly given at the intersection with column C. Thus if the dry bulb temperature is 100 degrees F. and the wet bulb temperature 85 degrees F., the dotted line drawn across the chart shows that the relative humidity, column C, is 54 per cent.

The chart is based on a special formula developed by the U. S. Bureau of Standards. The formula has been tested by the Bureau for dry bulb temperatures between 20 and 100 degrees Centigrade. An important advantage of this chart lies in the fact that it gives temperatures in both Fahrenheit and Centigrade.

—W. F. Schaphorst, M.E.

When Handling and Using Stencils

A STRIP of stencil lettering is often left assembled for some time as a matter of convenience, and the paint hardening on and near the joints makes the thin brass pieces very hard to pull or draw apart. The point of a small knife blade is commonly used to crack the paint with, but this practice is indeed not the best for the smaller and lighter stencils. Keep an old safety razor blade in the stencil box for use as shown. The thinner the blade the better. It can be easily worked up and down through the slides without the least possibility of damage to the thin brass, and the letters readily drawn apart. If the slides should be a bit loose, draw the edges of a block of soft wood up and down over them.

Quite often the thin narrow grooves are accidentally hit and crushed together. It is necessary of course to spread them only with some very thin and hard tool. Use the old razor blade for this also. Force it to the bottom of the groove, lay the stencil on some perfectly flat smooth surface and work a small smooth block of wood firmly back and forth over the dented part against the razor blade. If the slides are a little loose, work the block over it alone lightly a few times.

The thin brass pieces after they have been used should of course be carefully cleaned and wiped, but we often run into a set of dirty ones which some careless fellow has left. They are indeed an aggravating thing to handle because so thin and light and slip and slide on any smooth surface if any pressure to speak of must be applied to them. Take a piece of old tire inner tubing and tack it snugly around a small light board. Laid on the rubber, the pieces are easily handled, worked with and readily picked up. Absolutely no danger of denting or marring the thin brass. Easy to lightly scrape and wipe them if necessary.

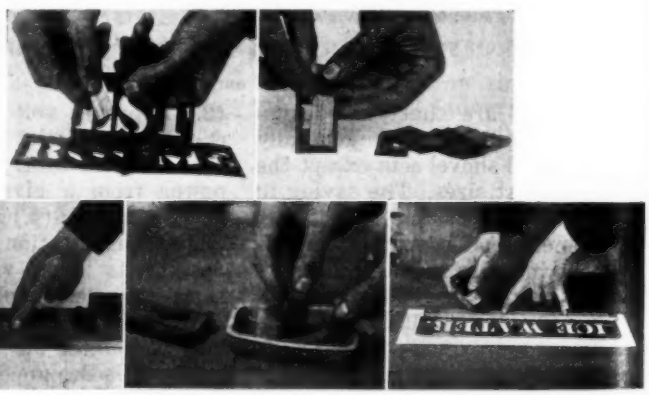
Cleaning up a set of stencils immediately after using while the paint is yet soft is at best a mean, untidy job. Usually a container for the oil bath is found in any odd tin can or pan much too large, and in which one must use far too much oil. You cannot conveniently work the small oily rag or bit of waste over the thin brass pieces either. Get a common soft rubber soap tray and keep it for this purpose. Carefully cut away the two ribs in the bottom, making it perfectly smooth and flat. This makes an ideal thing to scrub and clean the stencils in. Holds a small but right amount of oil at a time, the soft rubber will not mar or injure the thin brass, while the finger tips only are in the oil. The kerosene will not get spilled all over the table or bench you are working on.

A rather long strip of lettering as shown above is difficult to handle alone and keep pressed to the surface being marked. If you apply to a vertical surface the process is indeed a clumsy one. Take a small narrow stick a bit longer than the assembled lettering. Nail or tack a strip of tire tubing or a rubber band to one side of the stick. Press this to the stencils as the brush is used. It will afford a clear, clean job of lettering and there is no danger of the strip slipping or jumping through a poor grip with the fingers.

—Frank W. Bentley, Jr.

An old razor blade can be worked between the slides without damage to the thin brass.

Razor blade also comes in handy for spreading the narrow grooves if they become crushed.



Cleaning is made easy if the sections are laid on old inner tubing.

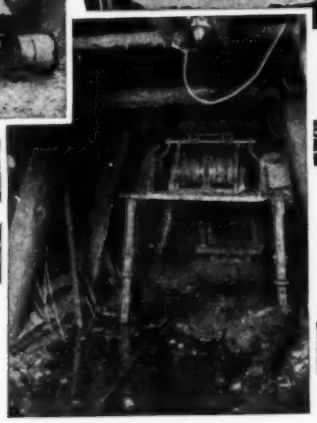
Soft rubber soap tray makes an ideal cleaning "pan" for stencils.

Here is shown a handy way to hold a long strip of lettering when using.

Tough!...

DRENCH IT WITH WATER
...NO EFFECT

CRUSHING PRESSURE... OR JAGGED EDGES—IT LAUGHS AT ABUSE



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SHOTS from the Firing Line

Million Highway Workers Record an All-Time High

ALMOST a million men were employed in highway and dependent work at the beginning of the year including men engaged in highway building on State and Federal roads only and those working in related industries. These figures collected by the Bureau of Public Roads, U. S. Department of Agriculture, which is administering the $400,000,000 appropriation for public works highways made by the last Congress, show also that the employment of men on Federal and State highways has reached an all-time high for the winter season.

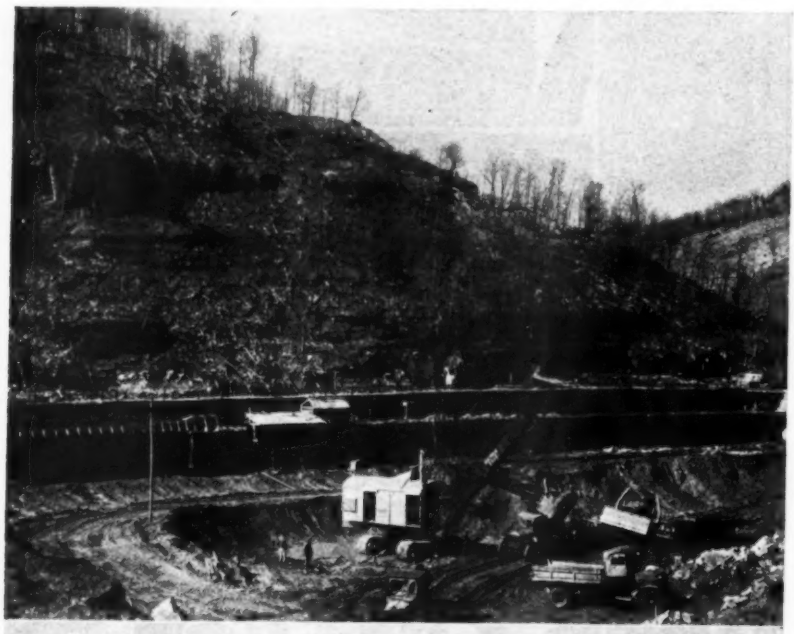
A grand total of 956,000 men were employed at the beginning of the year on Federal and State highway activities divided as follows: employed at the sites of the highways, 362,000; industrial labor in dependent industries such as stone quarries, gravel pits, etc., 543,000; administrative and supervisory labor, 51,000. Assuming a family of three, the persons supported by these laborers in highway activities number 2,868,000. The number of names of men appearing on the payrolls is materially larger than the figure given due to labor turnover. This record peak of winter employment exceeds the highway employment figures for the summer months of last year.

Highway employment at the beginning of the year, divided by classes of roads, for men engaged on State and Federal work at the sites of the highways was as follows:

Public works highway construction supervised by the Bureau of Public Roads	134,862
Federal relief highway construction projects supervised by the Bureau of Public Roads	36,366
Regular Federal-aid highway construction supervised by the Bureau of Public Roads	1,723
Forest, park and public land road construction supervised by the Bureau of Public Roads	1,407
State highway construction with State funds	46,810
State and Federal highway maintenance	140,832
Total Federal and State employment	362,000

The recent severe weather has caused a decrease in the total number of men employed directly in road building operations but a marked increase of employment is expected as soon as the weather breaks.

Over 70 percent of the $400,000,000 appropriation for public works highways is involved on highway work already advertised for contract or under construction.



Progress on T.V.A. is shown in these recent views. The upper picture shows excavating operations at Norris Dam (near Knoxville, Tennessee). The lower picture comes from Wheeler Dam (near Sheffield, Alabama).

Aggressive National Highway Program Basis of Resolutions

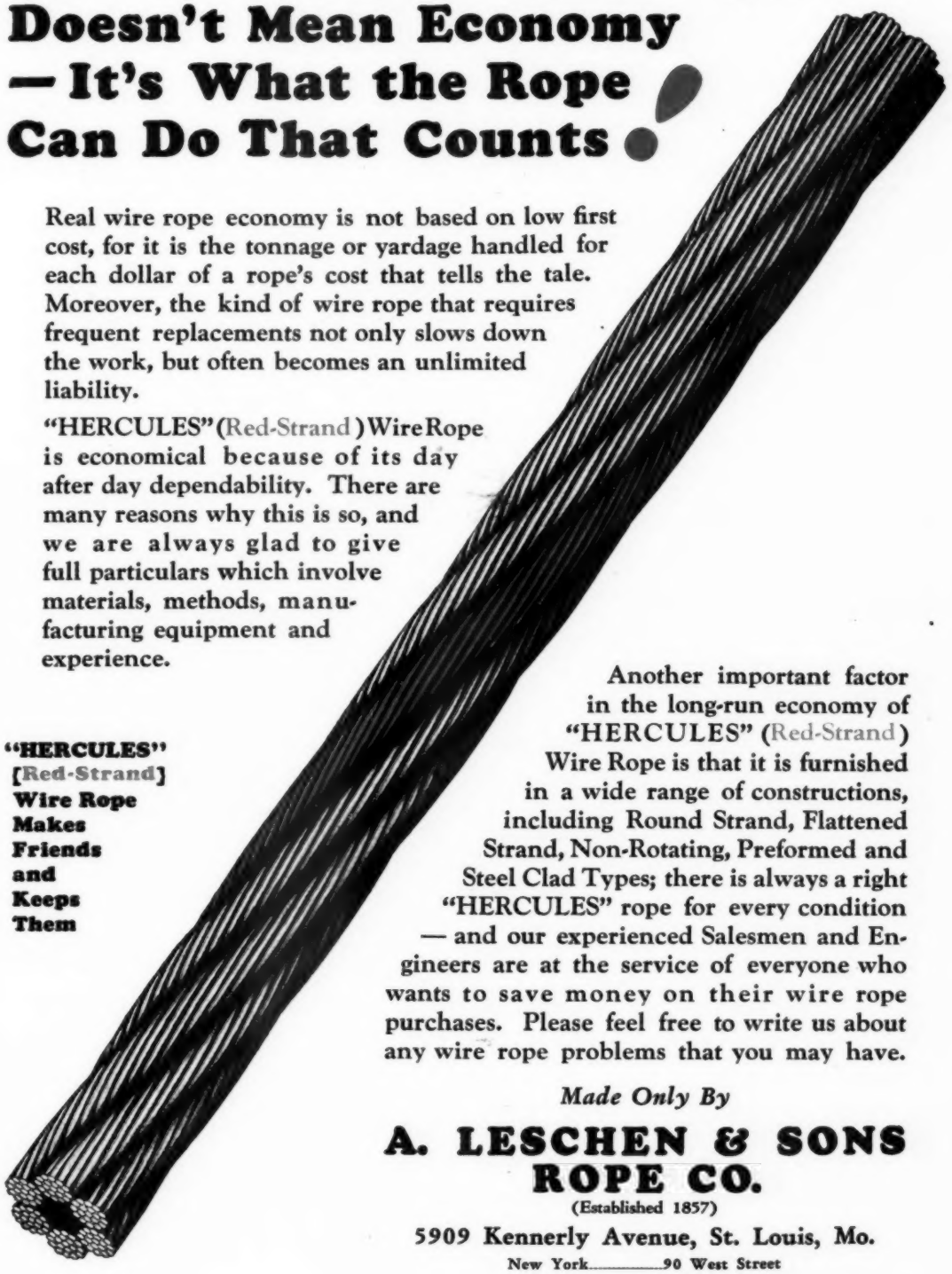
RESOLUTIONS adopted at the 31st Annual Convention of the American Road Builders' Association in Chicago during the week of January 22nd, form the basis for an aggressive national campaign for properly planned and adequately financed programs for the improvement and maintenance of the highways of the United States.

The resolutions propose: 1. An additional federal highway appropriation of $400,000,000 for the fiscal year 1935. 2. The restoration of appropriations for routine Federal Aid to be matched by the States. 3. Long range advance planning of governmental construction projects. 4. The use of gasoline tax and motor vehicle revenue for highways only. 5. Liberalization of terms for loans and grants to cities and counties on non-Federal public works projects under the P. W. A.

A.R.B.A. Stresses Need for Highway Development

ALTHOUGH the Federal Government today is engaged in a vast program of highway development

The First Cost of Wire Rope Doesn't Mean Economy — It's What the Rope Can Do That Counts!



Real wire rope economy is not based on low first cost, for it is the tonnage or yardage handled for each dollar of a rope's cost that tells the tale. Moreover, the kind of wire rope that requires frequent replacements not only slows down the work, but often becomes an unlimited liability.

"HERCULES" (Red-Strand) Wire Rope is economical because of its day after day dependability. There are many reasons why this is so, and we are always glad to give full particulars which involve materials, methods, manufacturing equipment and experience.

"HERCULES" [Red-Strand] Wire Rope Makes Friends and Keeps Them

Another important factor in the long-run economy of "HERCULES" (Red-Strand) Wire Rope is that it is furnished in a wide range of constructions, including Round Strand, Flattened Strand, Non-Rotating, Preformed and Steel Clad Types; there is always a right "HERCULES" rope for every condition — and our experienced Salesmen and Engineers are at the service of everyone who wants to save money on their wire rope purchases. Please feel free to write us about any wire rope problems that you may have.

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Shots From the Firing Line— *Continued*

speakers before the Convention of the A.R.B.A. in Chicago emphasized the need for continued highway improvement, citing the fact that there remain 2,000,000 miles, or about two-thirds of the nation's road mileage, not yet reached by road improvement. Also many miles partially improved to this date need further attention if hazards to highway safety are to be eliminated and the convenience of highway travel adequately served.

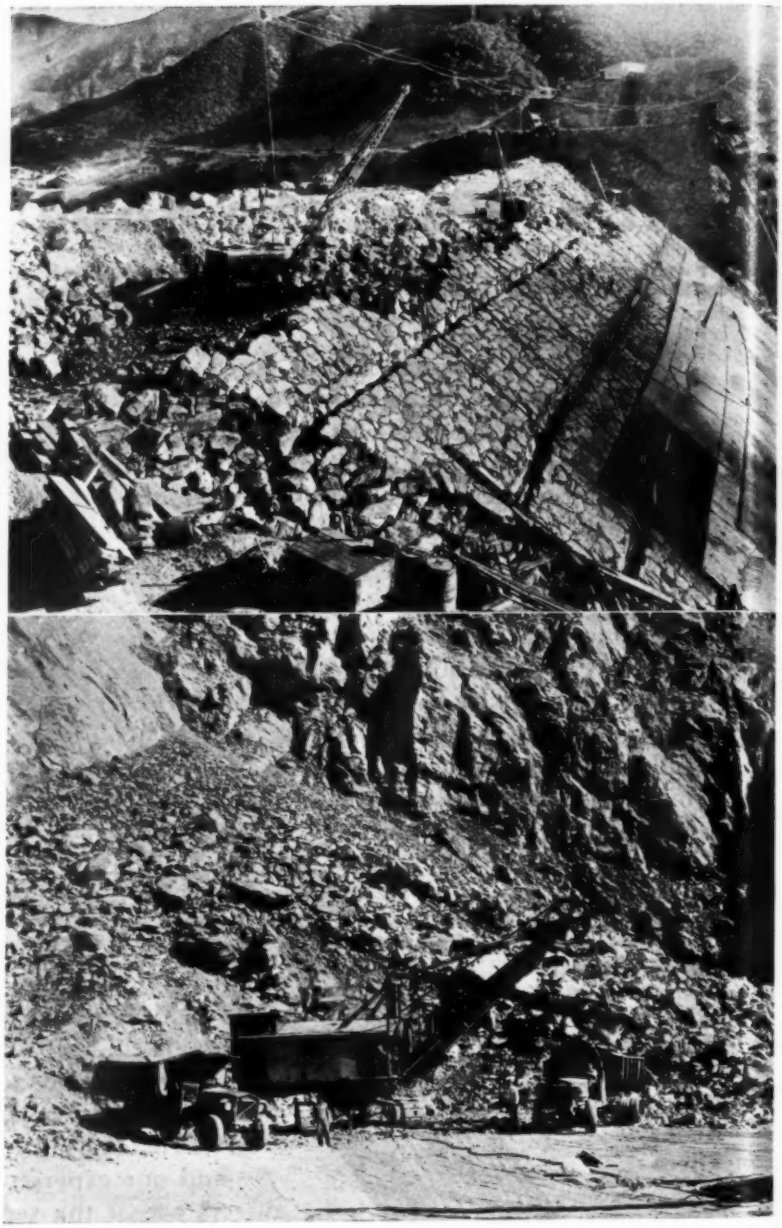
Facts and figures were given to show that it is reasonable and possible to have less mud to plow through on secondary roads and fewer accidents on the main roads if properly planned and adequately financed programs are conducted for the orderly improvement and maintenance of the highways of the entire United States. To gain these ends it was shown that there should be a fixed national policy toward highways.

The Association, by resolution, pledged its support for the Federal Government's projected long range planning of governmental construction, especially as it relates to the coordination of the highway systems of the federal, state and various other governmental units.

Another resolution adopted at the Convention urges Congress to authorize, at the earliest possible time, additional funds for highway construction setting as a goal the sum of $400,000,000 for the fiscal year 1935, which would equal the amount appropriated for the present fiscal year under the National Recovery Act. Emphasizing the importance of continued employment through Public Works construction this resolution urges that additional highway activity be approved now to allow ample time for the preparation and inauguration of additional highway projects by the states in an orderly and timely manner without cessation of construction activity.

One of the resolutions places the Road Builders' Association on record as endorsing the principles embodied in the Hayden Road Bill, now pending in the Senate, to revive the routine Federal Aid appropriation, sidetracked because of the Recovery Act. The Hayden bill would appropriate, in addition to any emergency appropriations otherwise made, the sum of $125,000,000 annually for each of the next two fiscal years under the established Federal Aid plan which requires the states to match the federal allotments and to maintain their existing highways at a high state of efficiency, provisions which were not included in the Recovery Act emergency appropriations made primarily for relief purposes.

In order to carry out these programs, especially those portions which relate primarily to work with state, county and municipal funds, the Association, in a resolution, unalterably opposed the diversion of funds derived from gasoline and motor vehicle licenses for purposes other than road and street construction, repair and modernization.

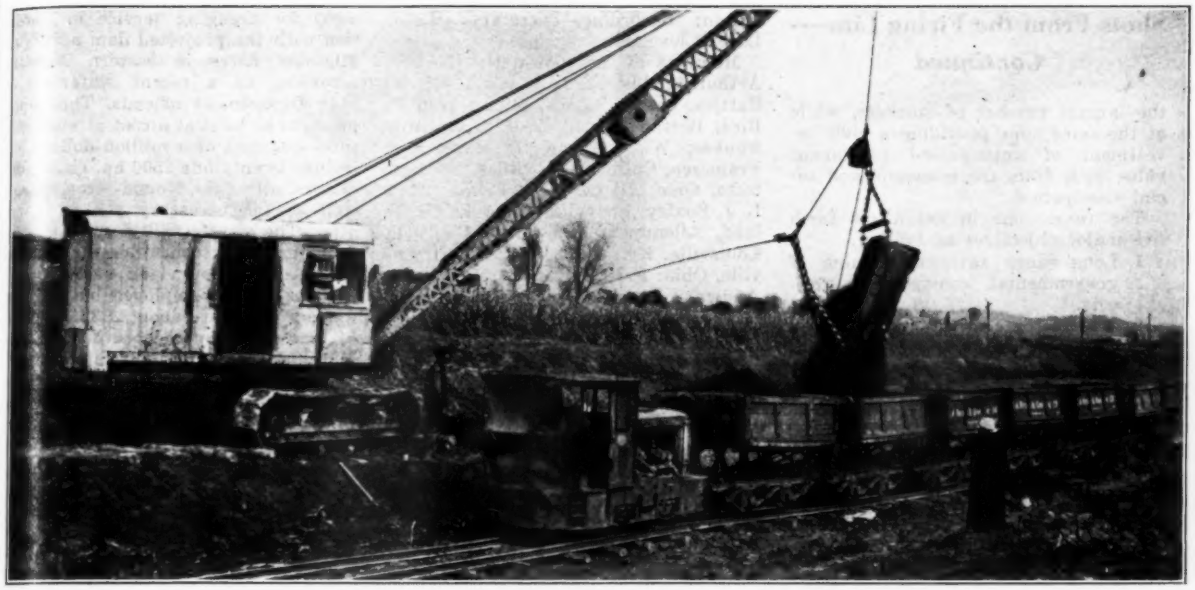


Finishing up San Gabriel Dam No. 2 where Macco-Lewis placed over 1,100,000 yards of rock well ahead of schedule. Pack rock going into place near the crest in the upper picture. Excavating in the quarry at the foot of the 270-foot face is shown below.

The financial structure of the highway program also will be aided by the Association through its demand for a liberalization of the policies involved in the approval of non-Federal works projects of cities and counties under the P. W. A.

The Road Builders by resolution commended the Public Works Administration and the Bureau of Public Roads for their intelligent direction of the highway work of current P. W. A. program and pointed out that "in order to continue the commendable work of the Public Works Administration," a renewal of the present year's appropriation at least, is necessary to provide for forest, park, Indian Reservation and unreserved public land roads as well as roads on the national federal aid system.

It was brought out at the convention that highway construction, forming the largest item of the P. W. A. program, gives the quickest and most widespread means of employment to



Western 5-yard heavy duty Dump Cars on the levee work of Keeley Bros. Contracting Co. near East St. Louis, Illinois.

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Shots From the Firing Line— *Continued*

the largest number of workers, while at the same time providing a civic investment of unsurpassed permanent value both from the economic and social standpoints.

The resolutions in detail set forth five major objectives as follows:

1. Long range advance planning of governmental construction projects.
2. The restoration of appropriations for routine Federal Aid to be matched by the states.
3. An additional federal highway appropriation approximating the sum of $400,000,000 for the fiscal year 1935 to be authorized now so that sufficient time may be given for the preparation of plans and the inauguration of projects by the states to avoid any interruption in highway construction activity and employment.
4. The use of gasoline tax and motor vehicle revenues for highways only.
5. Liberalization of terms for loans and grants to cities and counties on non-Federal public works projects under the P. W. A.

Progress on Public Works Highways to February 17, 1934

PROGRESS made on emergency construction of public works highways to February 17 under the supervision of the U. S. Bureau of Public Roads shows a total of 6,139 projects, estimated to cost $312,939,000 had been advertised for contract or begun by day labor employed directly by the highway authorities. The cost of the day labor projects included in the above is estimated at $22,429,000.

Of the 5,328 projects awarded for construction, 3,591 were under construction on February 17, and 651 were completed. The work under construction, which is estimated to cost $208,569,000, was given regular employment to 122,971 men.

In the whole country, work advertised for contract or started by day labor employed directly by the highway authorities involved 73.3 per cent of the $400,000,000 provided for public works highways under Section 204 of the National Industrial Recovery Act.

Officers and Members of Code Authority of Crushed Stone, Sand and Gravel and Slag Industries

OFFICERS of the code authority for the crushed stone, sand and gravel, and slag industries are: Chairman, Otho M. Graves, Easton, Pa.; Vice-Chairmen, H. V. Owens, Utica, Russell Rarey, Columbus, C. L. McKenzie, Pittsburgh; Executive Secretary, V. P. Ahearn, Washington; Treasurer, Harris N. Snyder, Buffalo; Assistant Treasurer, J. R. Boyd, Washington; Recording Secretary, H. J. Love, Cleveland.

Members of the code authority are: Arthur L. Allen, Pueblo, Colo.; H. N. Battjes, Grand Rapids, Mich.; Paul P. Bird, Boston, Mass.; A. J. Blair, Milwaukee, Wis.; Anson S. Blake, San Francisco, Calif.; W. E. Bliss, Youngstown, Ohio; H. G. Boyd, Selma, Ala.; L. J. Boxley, Roanoke, Va.; John Buckland, Allentown, Pa.; H. P. Caldwell, Louisville, Ky.; F. D. Coppock, Greenville, Ohio; Fred Curtis, Omaha, Nebr.; Anderson Dana, New York City; H. S. Davison, Pittsburgh, Pa.; K. A. Dietrich, Ecorse, Mich.; Earl Flad, Pittsburgh, Pa.; R. C. Fletcher, Des Moines, Iowa; Wilson Foss, New York City; Alexander Foster, Jr., Philadelphia, Pa.; George W. Gauntlett, Seattle, Wash.; J. Rutledge Hill, Dallas, Texas; J. J. Hock, Baltimore, Md.; Fred Hubbard, Youngstown, Ohio; C. E. Ireland, Birmingham, Ala.; W. H. Klein, Chattanooga, Tenn.; E. J. Krause, St. Louis, Mo.; George A. Mattison, Jr., Birmingham, Ala.; Thomas McCroskey, Knoxville, Tenn.; L. E. McDermut, Chicago, Ill.; Robert J. Potts, Waco, Texas; John Prince, Kansas City, Mo.; S. J. Reader, Minneapolis, Minn.; H. E. Rodes, Nashville, Tenn.; Eric Ryberg, Salt Lake City, Utah; W. R. Sanborn, Kankakee, Ill.; H. M. Sharp, Toledo, Ohio; J. L. Shiely, St. Paul, Minn.; W. A. Smoot, Washington; F. P. Spratlen, Jr., Denver, Colo.; E. Guy Sutton, Mattoon, Ill.; Ford J. Twaits, Los Angeles, Calif.; C. A. Wagner, Sioux Falls, S. D.; H. E. West, Muskogee, Okla.; T. I. Weston, Atlanta, Ga.; R. S. Wilson, Little Rock, Ark.; W. F. Wise, Dallas, Texas; M. W. Woodward, Rock Springs, Wyo.; A. L. Worthen, New Haven, Conn.; A. W. Worthington, Pittsburgh, Pa.; Porter W. Yett, Portland, Oregon. The Administration Member is R. E. Plimpton, Assistant Deputy Administrator of the National Recovery Administration, Washington, D. C.

The executive committee of the code authority consists of: Otho M. Graves, Easton, Pa.; H. V. Owens, Utica, N. Y.; C. L. McKenzie, Pittsburgh, Pa.; W. E. Bliss, Youngstown, Ohio; H. P. Caldwell, Louisville, Ky.; Alexander Foster, Jr., Philadelphia, Pa.; J. J. Hock, Baltimore, Md.; C. E. Ireland, Birmingham, Ala.; E. J. Krause, St. Louis, Mo.; Robert J. Potts, Waco, Texas; John Prince, Kansas City, Mo.; H. N. Snyder, Buffalo, N. Y.; E. Guy Sutton, Mattoon, Ill.; A. L. Worthen, New Haven, Conn.; R. E. Plimpton, and V. P. Ahearn.

The executive council includes Messrs. Graves, Owens, Rarey, McKenzie, Foster, Snyder, Plimpton and Ahearn of the executive committee.

Headquarters of the code authority are maintained at 951 Munsey Building, Washington, D. C.

G. E. to Build Motors for Montana Dam Project

THE General Electric Company will supply the electric motor equipment for dredging service in connection with the projected dam across the Missouri River in eastern Montana, according to a recent statement by War Department officials. This equipment, to be built at a cost of more than three-quarters of a million dollars, will include twenty-one 2500 hp. main pump motors, all of the wound-rotor type, as well as the necessary control apparatus. The motors will be used to equip four dredges, four floating booster stations, and four land stations. The dredges will be employed by army engineers to move about 1,325,000 tons of material from the bed of the upper Missouri River. It is estimated that the entire cost of the construction work on the new dam, which will be done in stages over four years, will approximate $59,000,000.

The body of water which will be backed up by the proposed dam will have a shore line of more than 1520 miles and will cover over 17,000,000 acres of land now occupied by 300 ranches and two small settlements. The lake will extend 174 miles. The dam will assure a dependable river channel eight or nine feet deep for navigation purposes.

The dredges will be assembled at Fort Peck, Montana, and it is estimated that 41 railroad cars will be required to transport the General Electric apparatus, which will weigh more than 1,760,000 pounds, to that place.

New England Notes

By E. D. COOGAN

Most outside construction work in New England is shut down at the present time due to the sub-zero weather that has been holding on for the last month or more. A number of prominent contractors have taken advantage of this lull and are now sojourning in the warmer climes. A few of these fortunate individuals are W. R. Smith of The Lane Construction Corporation, David Bridge of the A. D. Bridge and Son, Jack Arute of Arute Brothers, Incorporated and D. Arrigoni.

At the Connecticut Highway letting on February 13th the successful bidders were: **The Lane Construction Corporation** of Meriden, Connecticut; **Altieri Construction Company** of Waterbury, Connecticut; **E. Balf Company** of Hartford, Connecticut and **The M. A. Gammino Construction Company** of Providence, Rhode Island.

The Crandall Engineering Company of Boston is ready to start operations on their bridge job over the Mystic River in Massachusetts as soon as the weather permits.

The P. J. Carlin Company of New York is clearing and grubbing and doing some preliminary work on two bridge jobs over the Cape Cod Canal at Bourne and Sagamore; also C. W. **Blakeslee and Sons, Incorporated**, are doing some work on their railway bridge job over the canal but the work will not get into full swing until there is a break in the weather.

The City of Haverhill is operating

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Shots From the Firing Line— *Continued*

its new Bucyrus-Erie 1020 in its gravel pit.

We have just received a very interesting booklet published by the New England Road Builders' Association listing all the **highway and bridge jobs that were advertised and awarded in 1933.** The totals are as follows:

Maine—Highways	$1,489,770
Bridges	385,414
New Hampshire—Highways	$1,719,476
Bridges	282,246
Vermont—Highways	$1,275,280
Bridges	153,374
Massachusetts—Highways and Bridges	$5,067,185
Metropolitan District Commission of Boston	$1,327,947
Rhode Island—Highways and Bridges	$1,268,657
Connecticut—Highways and Bridges	$5,084,842

New York Notes

By G. E. PETERSON

New York State lettings since Dec. 29th have included the following jobs: **M. F. Dollard, Sr. and M. F. Dollard, Jr.** of Albany; $167,494 for .58 miles of paving on Central Ave., Albany and also $240,391 for 1.65 miles of paving on State Street, Schnectady . . . **Brayer Bros.** of Buffalo; $366,576 for 3.64 miles paving on Main Street, Buffalo . . . **F. E. Shardon** of Lockport; $70,978 for 1.81 miles of concrete in Cayuga County . . . **Bolton, Suits, Bolton & Gibbs** of Watkins Glen: $14,707 for bridge and approaches in Schuyler County . . . **Spooner Bridge Co.** of Albany; $13,221 for bridge and approaches in Delaware County . . . **Thomas Brogan** of Yonkers $78,360 for .72 miles of paving in Westchester County on Route 100 . . . **Warren Bros.** of Cambridge, Mass.; $195,873 for 3.56 miles of 30' concrete in Saratoga County . . . **Louis Mayersohn** of Albany; $214,975 for 4.55 miles of concrete in Essex County. This job includes 135,000 yards of excavation . . . **Chas. Shaffer & Sons** of Buffalo; $197,701 for 2.82 miles of grading and structures in Suffolk County . . . **Fred Ray** of Herkimer; $22,681 for paving in Oswego County . . . **Davis & Stearns** of Whitney Point; $191,885 for 3.56 miles of concrete in Saratoga County . . . **The W. W. Const. Co.** of New York; $111,225 for grade separation in Nassau County, also $129,331 for grade separation in Queens County and $81,292 for grade separation in Nassau County. **Faircraft Engineering Corp.** of Brooklyn; $67,792 for grade separation in Suffolk County . . . **Mill Basin Asphalt Corp.** of Brooklyn; $143,497 for grade separation in Queens County . . . **The Rome Construction Co.** of Glendale, L. I.; $47,970 for grade separation in Queens County . . **Woodcrest Construction Co.** of New York; $102,155 for grade separation in Queens County . . . **The Arthur A. Johnson Co.** of Long Island City; $101,866 for grade separation in Queens County . . . **Peter Bruno** of Pelham; $65,997 for .14 miles concrete in Orange County . . . **The Carlton Co., Inc.,** of New York; $107,822 for grade separation in Nassau County . . . **Warren Bros. Roads** of Cambridge, Mass.; $194,680 for 4.02 miles concrete in Essex County. This job includes 105,150 yards of excavation . . . **N. D. Peters Const. Co.** of Utica; $46,546 for bridge and approaches in Oneida County.

The New York State County Superintendents' Association held its annual winter convention at Albany on January 31 and February 1. Headquarters were at the DeWitt Clinton Hotel and the meeting was well attended by superintendents as well as representatives of various material and equipment manufacturers.

Bids were taken February 21 on the 38th Street vehicular tunnel between Manhattan and Weehawken as follows: Mason Hanger, Inc., $6,452,300; George Flinn Corporation, $7,393,214; Carleton Company, Inc., $7,414,753; Thompson Starett Engineering Associates, $7,490,333; and Rosoff Braden, $8,783,830.

Pennsylvania Notes

Excavating men are extending **sincere sympathy** to Alfred John Schrader, well known mining and stripping contractor who lost his wife after a brief illness recently. Mr. and Mrs. Schrader had been married for ten years. They made their home at Scranton.

Employees of the Universal, Pa., plant of the **Universal Atlas Cement Company** completed 1,000 days without a lost-time accident on January 31, according to an announcement made by Gordon C. Huth, manager of the company's Safety and Casualty Bureau.

"There was a time in the industry when a plant could justly be proud if it completed a month without a lost-time accident, but with improved safety devices and cooperation of every employee, completion of a year without an accident became the aim of every plant. The plant (Universal) has been a three-time winner of the Portland Cement Association trophy awarded each year for a perfect safety record, having completed 1930, 1932, and 1933 without a lost-time accident. In addition the plant was also awarded the Joseph A. Holmes Safety Association certificate of honor for conspicuous achievement in safety in 1930."

This Universal organization is the third of the company's plants to complete 1,000 days without an accident.

Safety work at the Universal plant is under the supervision of Mr. Slocum and J. R. Cline, Assistant Superintendent, who heads the Safety Committee.

Maryland Notes

By F. J. FAIMANN

The Frederick Snare Corporation of New York has been awarded the $947,676 contract for the major project of Maryland's $12,000,000 highways improvement program, the construction of a bridge over the Choptank River, connecting Cambridge in Dorchester County, with the southern portion of Talbot County. Officials of the State Roads Commission said it would take about a year to complete the structure, whose total length from undercoping to undercoping of the abutment is 8,746 feet. This item is one of thirteen expected to be begun during February, and for which contracts have also been awarded. They will involve the expenditure of thirty per cent of the PWA road fund. The work which was awarded to the Snare firm does not include the proposed approaches to the structure, which will be taken care of in contracts to be let later.

The Public Works Administration has agreed in writing to contribute $5,411,866 under the debenture plan toward Maryland's $12,000,000 highway improvement program. Maryland will borrow $4,000,000 on debentures from PWA, and be given an outright grant of $1,411,866 additional. To the total of $9,011,866 obtained from the PWA through the $3,600,000 highway appropriation plus the $5,411,866 obtained through the debenture plan, regular State funds and additional sums expected to be made available by Federal agencies will be added to make up the $12,000,000 needed to carry the entire program.

For their bid of $866,000, the **Merritt-Chapman-McLean Corporation** of Baltimore was awarded the contract for constructing a reinforced concrete seawall around Fortress Monroe, Virginia.

John W. Cowper Company of Washington, D. C., was let the contract for construction of a bridge over Rock Creek at Calvert Street. The total bid amounted to $928,728.

Washington Notes

Robert M. Rogers of Washington, D. C. writes that he has recently been on work with R. E. Latimer's oldest Gas+Air and says that it is "still going strong" after six years of service.

Tennessee Notes

Tennessee Valley Authority awarded **Chandler Brothers, Inc.** of Virgilina, Virginia, the contract for 6.5 miles of highway at a bid of $132,394.

Ohio Notes

National recovery highway projects in 16 counties amounting to more than $965,000 were announced by Highway Director O. W. Merrell for letting, February 23 and 24. Total construction mileage involved is 27.922. Contracts for highway construction in 19 counties exceeding an estimated expenditure of $1,135,000 were let by the State Highway Department on February 16 and 17.

Revenue obtained from the sale of **motor vehicle license plates** in Ohio

THE AUTOBIOGRAPHY OF AN EXPLOSION

This is the business end of a Bichel Gauge. It is a remarkable apparatus that records the amount of pressure generated every instant during the split-second duration of an explosion. The chart may be likened to a slow-motion picture... effect, slowing up an explosion so its characteristics can be observed. Study of these data aids us to develop explosives to meet various field conditions and to help make certain that our explosives adhere to specifications.

Hercules owns one of the few Bichel Gauges in this country. By means of this and other exacting tests we obtain the reliability which is so characteristic of Hercules explosives.

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A-39

Shots From the Firing Line—*Continued*

during 1933 was $17,153,243, Glen M. Daily, Registrar of the Bureau of Motor Vehicles reported to State Highway Director O. W. Merrell.

O. W. Merrell, Ohio Highway Director, announced the tentative awarding of contracts on NRH projects included in the February 9th letting. The awards are subject to Federal approval and include: **Launder & Son, Incorporated,** Toledo, $24,205 for 0.430 mile concrete on North West street in Lima on State Route 65; **Harvey Candel,** Bucyrus, $9,597 for 0.116 mile concrete in Defiance on State Route 49; **Lynn Construction Company,** Paulding, $6,960 for 0.180 mile concrete in Milford township on State Route 49; **B. F. Patterson,** Columbus, $114,310 for 2.824 miles asphaltic concrete surface course in Perry township, Franklin county; **Andrews Asphalt Paving Company,** Hamilton, $99,494 for 2.709 miles asphaltic concrete surface course and concrete beam bridge over Clear Creek; **A. S. Langonderfer, Inc.,** Toledo, $85,-365 for 2.957 miles bituminous macadam surface course in Richfield and Spencer townships in Lucas County; **Beightler & Hussey,** Columbus, $70,-962 for 1.056 miles concrete in Chesterhill Village and Marion township on State Route 77 in Morgan County; **Dunzweiler Construction Company,** Zanesville, $96,928 for 2.207 miles asphaltic concrete surface course and concrete, including 0.324 mile in South Zanesville and 0.483 mile in Zanesville, also concrete beam bridge over Shawnee Run in Muskingum County; **Kelley Brothers Construction Company** of Portsmouth $17,282 for 0.310 mile concrete and brick including 0.259 mile in Circleville on State Route 56-U. S. 22 in Pickaway County; **Purdy Construction Company** of Mansfield, $42,234 for 0.078 mile deck-plate girder bridge with concrete deck and sub-structure over Clear Fork Creek in Lexington on U. S. 42 in Richland County; **W. M. Brode Co.,** Newcomerstown, $9,971 for 0.197 mile brick on Johnsons Ave. in Dennison on State Route 8; **General Asphalt Paving Co.,** $124,221 for 2.328 miles brick including 0.214 mile in Mt. Eaton, U. S. 250 in Wayne county; **G. L. LaBoiteaux,** Toledo, $59,973 for 0.905 mile concrete and brick on Superior Street in Rossford and Ross Township on U. S. 23-68 and State Route 65 in Wood County; **U. S. Construction Company,** Upper .Sandusky, $19,041 for 1.263 miles bituminous macadam in Crawford and Ridge townships on State Route 15 in Wyandot County.

Michigan Notes

By CLYDE B. DAVIS

The State Highway Department, the Highway Association and leading road builders are attempting to impress upon the administration the **advisability of diverting to road building** a large part of the CWA and other Federal funds allotted the state for reconstruction purposes. It has been shown by figures that large sums are being spent for materials upon jobs that give work to a small number of workmen and that many foundations for buildings have been laid on which it is unlikely that the buildings can be finished. Particularly, the highway men seek to encourage careful investment of the latest million dollars given the state for purchase of materials, contending that in road work the amount spent for materials is small compared to the amount of labor and to the amount of constructive work accomplished.

The Construction Materials Company of Chicago, one of the two contractors on the Monroe port project, has filed a voluntary receivership petition in the Delaware District Court and A. D. Plamandon and Charles L. Reese have been named receivers. Pending reorganization attempts the court authorized the company to continue projects on which it is working.

D. W. Thurston Company of Detroit submitted low bid of $209,509 for the Woodward Avenue grade separation in Detroit. The span of the new separation is to be 90 feet, and 120 feet wide. The Grand Trunk railway, Michigan Central and New York Central were obliged to meet a cost of $86,000 in construction because of the contract for the job.

Indiana Notes

By C. BRUCE McCOWN

John Dehner, Inc., Fort Wayne, was low bidder February 14th on excavation for the sewage disposal plant at Bloomington, Indiana. The job is expected to be awarded and work started in about four weeks.

N. B. Putman, Fort Wayne, has three State Highway jobs going in Pennsylvania and New York states and reports excellent progress.

Hines & Hoffman, Muncie, are starting a new county gravel job with their Bucyrus-Erie 1030 dragline. Job is about five miles north of Hartford City, Indiana.

J. E. Sweet & Sons, Woodburn, have just completed their bridge job on Route 14 near South Whitely, Indiana. **Charles Jacobs, South Whitely, Indiana,** handled the excavation and fill for them.

Roy Treesh, Milford, is finishing a county job near Plymouth, Indiana.

Ralph Myers and Kile Killman, Salem, left for Florida February 6 for a two weeks' vacation. They expect to be back for the February 27th letting.

Calumet Paving Company has about half the excavation completed on the Salem end of the Paoli-Salem road job. George Verplank is well pleased with progress made this winter.

Two highway lettings are to be held in Indiana in February. Five bridge projects involving thirteen structures are to be let February 20. Thirty-one highway projects are to be let February 27th. Both lettings total about $2,000,000.

Nebraska Notes

Dobson & Robinson Company of Lincoln was awarded contracts for 7.5 miles of paving in Platte County and 1.1 miles of paving in Lincoln County at $210,858 and $50,017 respectively; **Abel Construction Company,** Lincoln, was awarded contracts as follows: Kearney County, 0.6 miles of paving at $28,997, Kimball County, 0.8 miles of paving at $23,382, Deuel County 0.6 miles paving at $29,471. **P. Kiewit & Sons** of Omaha secured 1.6 miles of paving in Valley County at $36,942;

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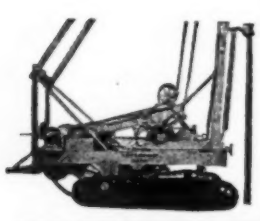

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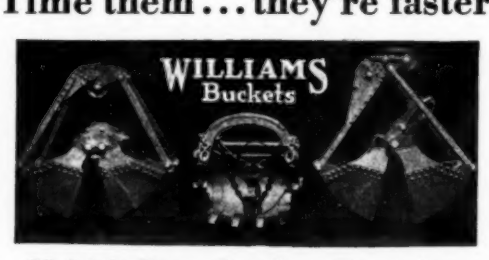

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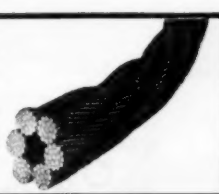

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Shots From the Firing Line—*Continued*

Roberts Construction Company, 0.6 miles of paving in Cherry County at $41,936.

Missouri Notes

By ERNEST W. FAIR

WALTER G. MOSER

Walter G. Moser, Secretary-Treasurer of the Moser-Shannon Construction Company and sponsor of amateur baseball teams, died of heart disease at his home in St. Louis after a three weeks illness. He was 41 years old. Mr. Moser was born in Belleville and came to St. Louis in 1916 as secretary of the Graner Construction Company. The Moser-Shannon firm was organized Feb. 1 of last year. Once an enthusiastic ballplayer, he sponsored several teams in the municipal league and last year sponsored and managed a boys' team.

By A. J. KOENIG

Bids to the amount of $1,903,300 for the construction of highways were received by the Missouri State Highway Commission Jan. 19th. The work includes **68.5 miles National Recovery roadway**, 12.2 miles under the P.W.A. and 83 miles of roadway to be built by the State. Low bidders on the grading jobs are as follows: 2.2 miles in Cedar county, route S.A., to L. L. Sharp, $19,133. 13.7 miles, route A.P., Daviess county, to Ackley Bros. and Fred M. Clark & Sons, $114,254. 5 miles Howell county, route S.E., to Carte-Harlin Construction Co., $17,971. 3.3 miles, route S.J., Lafayette county, to Jos. L. Pohl, $6,195. 4.6 miles, route S.D., Newton county, J. M. Roark, $21,669. 4.9 miles, route S.C., Ozark county, Carte-Harlin Construction Co. $33,664. 8.6 miles, route S.C., Randolph county, Atkinson Paving Co. & C. W. Rose, $32,-399. 8.7 miles, route S.A., Vernon County, W. D. Knoll, $25,539. 0.57 miles graded earth and bridges, Worth county, route 76, L. W. Hayes, $23,-519. 8.7 miles graded earth and gravel, route 19, Shannon county, Frank Gaines & S. A. Robertson, $91,492.

Cameron-Joyce & Co. were low for paving 6.6 miles, route 24, Monroe county.

James R. Hancock was low with a bid of $103,896 for grading and gravel on route 100 T.R., Franklin county.

Another highway letting will be held at Jefferson City about Feb. 28th.

Several nice highway and bridge construction contracts were let by the Illinois Highway commission early in February to the amount of $425,000. Following are some of the lucky contractors: Harry Riley, 4.06 miles traffic bound surface course, route 6, Shelby county. Dungey & Cochran, bridge over the C. & E. I. R. R. at Cypress, Johnson county. Tritt Bros. 0.49 miles grading approaches to B. & O. R. R. overhead crossing, route 159, St. Clair county. W. H. Laird, 0.41 miles bituminous retread, route 1-A, Hardin county. 3.35 miles paving to L. B. Dyer Construction Co. on route 11, McLean county. Central Engineering Co. 3.6 miles paving route 32, Rock Island county. Birt Bros., 0.65 miles traffic bound surface course, route 3-A Jackson county. Three bridges route 3-A, Jackson county to Casey Construction Co. Harrelson & Johnson 4.91 miles traffic-bound surface in Massac county.

MICHAEL COSTELLO

It is with regret that we learn of the death of Michael Costello, one of the old school of grading contractors. Mr. Costello was killed instantly when he was struck by a passenger train within a block of his home. He will be missed by a host of friends and many of the "old timers".

Walsh Construction Company was low bidder for the construction under the Wabash railroad in Christian county, Illinois.

The James Stewart Company of Chicago was low bidder with a bid of $1,-346,720 for the construction of Lock No. 12 on the Mississippi River at Bellevue, Iowa. Twelve bids were offered ranging from the low to $1,492,341, the high bid. The government estimate was $1,448,249.

Bids were received Jan. 26 at Kansas City, U. S. Engineers Office for the construction of a railroad bridge across the Missouri River at Fort Peck Dam. The following bids were tendered, A. Guthrie & Co. $1,170,463. W. A. Ross Construction Co. $1,077,067. Minneapolis Bridge Co. $1,046,910. Kansas City Bridge Co. $990,877, and Massman Construction Co., low bid, $984,771.

Bids for constructing the Guttenberg Lock No. 10, on the Mississippi River were opened at Rock Island on Jan. 30. **Hanlon & Okes**, St. Paul, were low with a bid of $1,363,304. Eleven bids were offered. The U. S. Engineers estimate was $1,474,431.

Lefferdink Construction Company was awarded the contract for placing 630,000 cu. yds. earthwork in rebuilding and enlarging back levee of Clear Creek Drainage district, Union and Alexander counties, Illinois.

By H. H. BUCHANAN

Kelly and Underwood have completed the six miles of concrete pavement from Farber to Vandalia in East Audrain County which is now ready for travel. U. S. Highway 54 is now concrete from the state capital at Jefferson City to the Illinois highway system at Louisiana, Missouri.

River Notes

New Orleans District

At bidding on January 29th, **McWilliams Dredging Company** of New Or-

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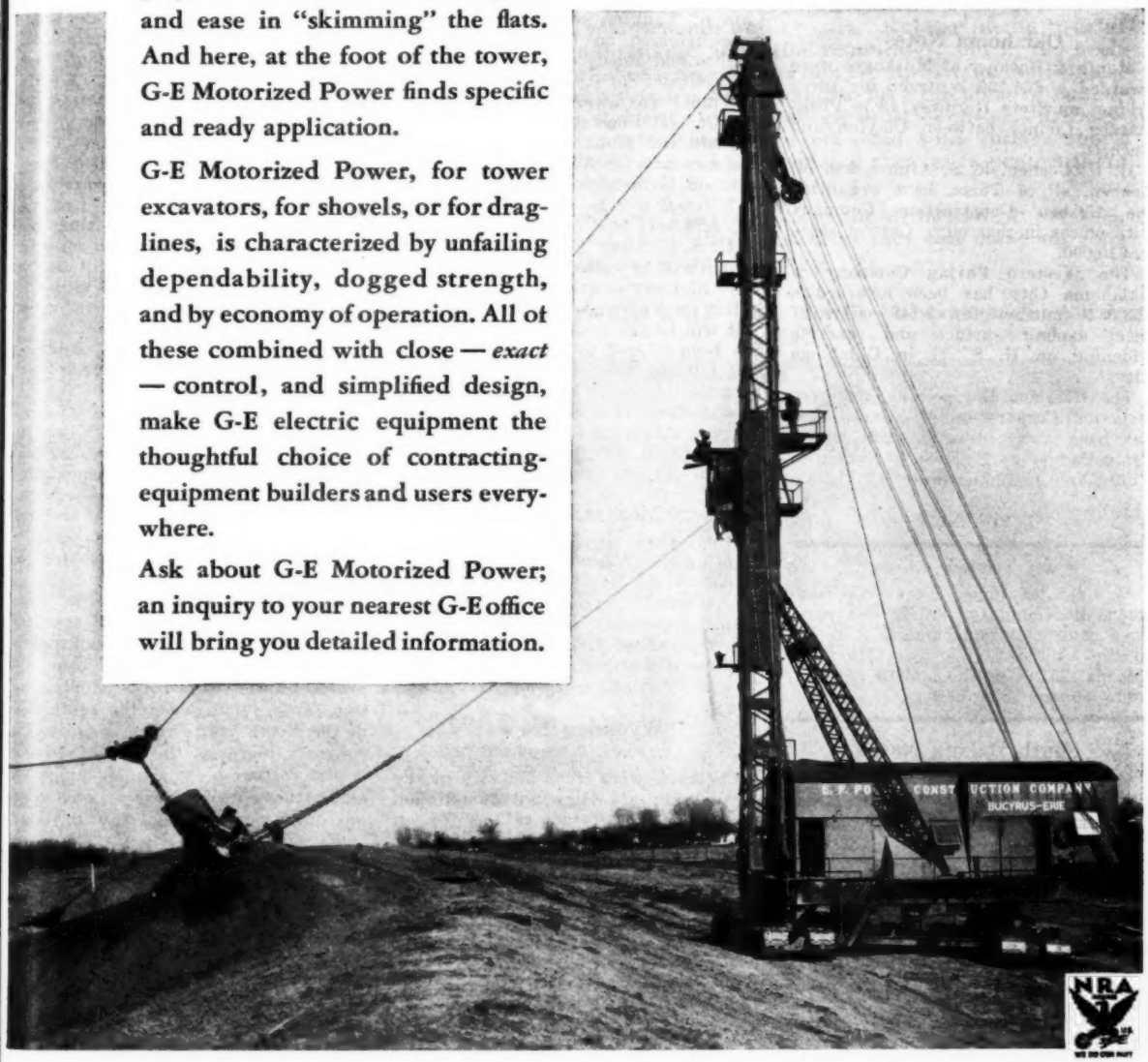

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Shots From the Firing Line— *Continued*

leans put in low bid of 46.7 for all or none on 2,880,000 cubic yards of Charenton-Intracoastal Canal levee. The work is suitable for handling with floating equipment.

Arkansas Notes

Hartmann-Clark Brothers Company of Peoria, Ill., with a low bid of $53,889 was awarded contract for construction of grading and minor drainage structures as well as concrete paving on State Highway 62 in Clay County.

Oklahoma Notes

Moran & Buckner of Muskogee were awarded a $64,366 contract for three bridges on State Highway 43 in Pushmataha County between Clayton and Burnett.

H. H. Goshen, R. S. Arnold, and M. Goshen, all of Tulsa, have organized the **Goshen Construction Company** with offices in that city. Capital stock is $10,000.

The Western Paving Company of Oklahoma City has been awarded a $53,632 contract for 1.148 miles of sheet asphalt surface and concrete widening on U. S. 77 in Oklahoma City.

The Harrison Engineering and Construction Corporation of Kansas City has been awarded a $114,249 job in Craig County on U. S. 66 beginning in Vinita and extending west.

Texas Notes

WILLIAM MEGINNIS

William Meginnis, 87, of San Antonio, died January 28. He was a retired contractor and builder. He came to the United States from Montreal, Canada, 75 years ago and to San Antonio 50 years ago.

South Dakota Notes

By PAUL G. FRIGGENS

Pavement, grading, guardrail and bridges on South Dakota highways in several counties at a cost of $117,451 were let by the South Dakota State highway commission at its January letting.

Grading contracts were awarded as follows: Hutchinson County, 13.285 miles on U. S. 81 south of Freeman, awarded to **Jarvis, Wright and Howell**, Sioux Falls, for $48,159. Beadle, 5.786 miles on county road east of Bonilla awarded to **Western Asphalt Paving Corporation**, Sioux City, for $17,186. Clay, 3.003 miles on county road west of Hub City awarded to **Frank Liebsch**, Arlington, for $6,243.

The contract for a 37-foot bridge on U. S. highway 81 in the city of Yankton was awarded to **Ellerman & McCain** of Yankton for $5,711. Awards were deferred on bridge projects in Hughes and Moody counties.

A contract for 0.660 miles of paving in Winner was awarded to the **Summit and Central Construction Company** of Summit and Sioux Falls for $29,903. The contract for 3.518 miles of pavement on U. S. highway 16 in the city of Mitchell will be awarded later.

Contractors **bids** for paving 13 miles of U. S. highway 16 to the Minnesota border **will be called for again** by the state highway commission at a special letting in February.

It will be the third time this project has been offered to contractors. Early last fall, all bids were rejected on the grounds they were too high. Later the commission picked the bid of the C. A. Wagner Construction Company, Sioux Falls, which was second lowest, but Federal officials failed to approve it.

Montana Notes

Mott Core Drilling Company of Huntington, West Virginia was low bidder on the test borings in the Missouri River Valley near Nashua, Valley County, Montana. Their bid of $21,348 consisted of 5100 lineal feet of core drilling at 3.93 per foot and 450 lineal feet of overburden drilling at 2.90 per foot.

Wyoming Notes

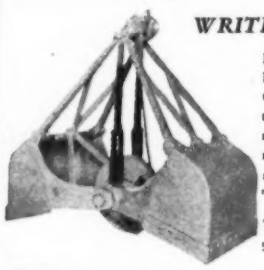
By PAUL G. FRIGGENS

Contracts were let in January by the Wyoming State Highway Commission on nine road projects calling for an expenditure of $367,347. The contracts were all awarded to low bidders. One project, calling for the paving of slightly less than half a mile of streets in Casper, was up for consideration a second time. All bids were rejected for this work at the December meeting of the commission and slight changes were made in specifications.

Following are the projects and the low bidders that were given the contracts: Construction of bituminous macadam pavement and miscellaneous work on 1.386 miles of Lusk streets, **A. H. Read** of Cheyenne, $61,386. Construction of two culverts, concrete pavement and miscellaneous work on .493 miles of Casper streets, **Ed Selander** of Greeley, Colo., $26,258. Construction of cement pavement and miscellaneous work on 1.602 miles of Rawlins streets, **Ed Selander**, $76,818. Grading, draining, construction of three culverts and two timber bridges and miscellaneous work on 17.269 miles of the Lingle-Lusk road in Goshen and Niobrara counties, **Sharrock & Purcel** of Casper, $80,706. Grading, draining, base course surfacing and miscellaneous work on 10.509 miles of the Rock Springs-Winton road in Sweetwater county, **J. W. Whiting** of Springvel, Utah, $42,383. Surfacing of 4.848 miles of the Lovell-Byron road in Big Horn county, **Threat Brothers Construction Company** of Lovell, Wyo., $4,239.

Base course surfacing of 14.095 miles of the Rock Springs-Pinedale road in Sweetwater county, **Northwestern Engineering Company** of Cheyenne, $22,053. Construction of oil treated surface on 8.106 miles of the Shoshoni-Thermopolis road in Fremont county, **Taggart Construction Company** of Cody, $26,293.

An automobile road to the point where the westward-bound covered wagons on the **old Oregon trail** clearly wrote their signatures has been approved by the Civil Works Administration for Wyoming. On the south side of the North Platte river, opposite the town of Guernsey, the pioneer Oregon trail crossed a sandstone ridge in which the wheels of the covered wagons cut grooves several feet in depth.



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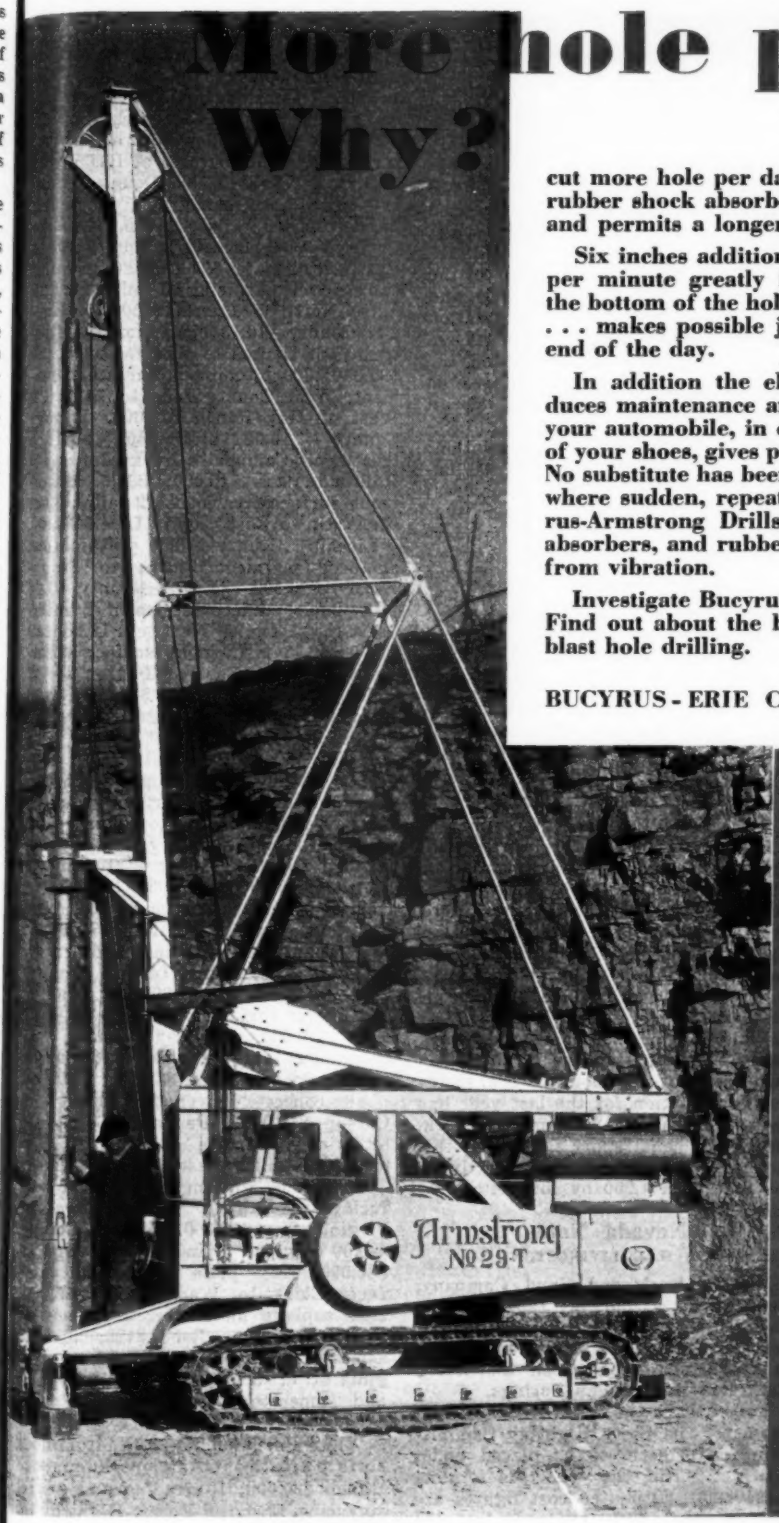

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Shots From the Firing Line—*Continued*

At no other place along the 1,800-mile route is the Oregon trail so clearly defined. The new road, which will cost $2,000, will parallel the old trail between federal highway No. 26 and a former state highway which crossed the trail about a mile to the west.

The Bureau of Reclamation will receive bids at Casper on March 7 for the construction of earthwork, tunnels, and structures, Casper Canal, from station 0 to station 190, on the Casper-Alcova project. The principal items and the estimated quantities involved are as follows: 418,500 cubic yards of all classes of open-cut excavation; 58,700 cubic yards of tunnel excavation; 5,000 cubic yards of backfill; 2,855 cubic yards of concrete in structures; 13,900 cubic yards of concrete in tunnel lining; 1,630 square yards of dry-rock paving; 1,400 cubic feet of pressure grouting; placing 413,000 pounds of reinforcement bars; furnishing and erecting 232,000,000 feet of board measure of permanent timbering in tunnel; installing 7,500 linear feet of drain pipe; and installing 27,600 pounds of gates and miscellaneous metal work. The work is located near Casper, and must be completed within 550 calendar days.

By ERNEST W. FAIR

An expenditure of approximately $4,577,500 was called for in Wyoming highway contracts awarded during 1933, figures of the state highway department, just released, show. More than 80 per cent of the program in Wyoming has been approved by the Bureau of Public Roads and within a short time all work will be under contract. The open winter has made it possible to continue construction work longer than usual and every effort has been made to keep men at work. Highway construction for the last year has kept an average of 2,000 men at work, the Department report shows. Of this number 775 were employed directly by the State and 1,200 by contractors.

Nevada Notes

By H. L. LIVINGSTON

Nevada Rock and Sand Company, Reno, with a bid of $204,276 was awarded contract for constructing that portion of the State Highway System in Clark County, between Charleston Park Road and Indian Springs.

Following is the **State Highway program** for the State Highway Commission for projects to be placed under contract during the year 1934 totaling $2,910,000. Estimated cost figures are shown and the figures preceding the description of the work represent the length in miles.

Churchill County—4.98 plant mix asphalt surfacing, Fallon to 5 miles south $125,000; 11.44 bituminous surface treatment 1 mile west of Lahontan to Leeteville $28,000. Clark County—5 bituminous surface treatment including underpass, Dry Lake to Crystal $70,000; 14.87 bituminous surface treatment Las Vegas to Charleston Road $37,500; 39 grading and gravel surfacing Charleston Road to West County Line $234,000; 17.70 grading and gravel surfacing 15 miles North of Las Vegas to Dixie Forest $210,000. Douglas County—4 grading and gravel surfacing Minden toward Woodfords $35,000. Elko County—0.79 concrete paving Elko to East City limits $35,000; 20 grading and gravel surfacing 5 miles to 25 miles North of Currie $120,000. Eureka County—10.15 bituminous surface treatment Eureka to East County Line $30,000; 969 bituminous surface treatment, West County Line to 14 miles West of Hay Ranch $28,000. Lander County — 15.92 bituminous surface treatment Campbell Creek Ranch to Railroad Pass $48,000; 23.76 bituminous surface treatment 12 miles East of Austin to East County Line $70,000.

Lincoln County—13.50 bituminous surface treatment Pioche to Stonehouse $38,000. Lyon County—0.66 bituminous surface treatment 2 miles West to 1 mile West of Lahontan $2,000; 6.41 bituminous surface treatment 12 miles East of Dayton to 12 miles West Lahontan $17,000; 0.98 bituminous surface treatment including bridge, Hoye to West County Line $33,500; 11 grading and gravel surfacing Yerrington to Wabuska $65,000; 5 grading and gravel surfacing 2 miles East of Mound House to County Line $27,000. Mineral County—12.65 grading and gravel surfacing State Line to Basalt $175,000; 20.03 bituminous treatment surface treatment 12.8 miles East of Hawthorne to Mina $160,000. Nye County—28 grading and gravel surfacing East County Line to 33 miles South of Beatty $168,000; 12 grading and gravel surfacing Carrara to State Line $90,000. Ormsby County — 1 bituminous surface treatment Carson Indian School Road $3,000; 1.25 asphalt concrete pavement in City of Carson $50,000. Pershing County—5 bituminous surface treatment Lovelock to 5 miles East $30,000. Storey County—2.50 grading and gravel surfacing Lyon-Storey County Line to Virginia City $15,000. Washoe County—0.50 concrete paving, Reno to Sparks $30,000; 13.39 plain mix asphalt surface, Clark to Wadsworth $325,000; 2.02 asphalt and concrete pavement Fourth Street in Reno $120,000; 2.13 asphalt and concrete pavement, Virginia St. in Reno $125,000; 2.25 asphalt and concrete pavement in Sparks $100,000.

White Pine County—6.65 bituminous surface treatment Antelope Summit to Illipah $20,000; 10 grading and gravel surfacing East end Forest Highway toward Ely $72,000; 15 grading and gravel surfacing Murray Summit toward Tonopah $105,000. Clark County—concrete bridge near Mesquite $9,000; timber bridge over Muddy River, including approach near St. Thomas $35,000. Lincoln County—

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AIR-COOLED ENGINES

Write for details

Designed especially to supply the demand for air-cooled engines in the compressor, truck, tractor and general industrial field, Domark engines do away with the losses so frequently caused by water-cooling delays. Available in 4, 6, 8 and 12 cylinder sizes, air-cooled power is now available to any manufacturer of equipment calling for from 12 to 200 horsepower.

This 6-cylinder Domark Air-Cooled Engine develops 104 horsepower at 2600 r. p. m.

THE DOMAN-MARKS ENGINE CO.
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NEED A TRAILER?
COME TO THE BUILDERS OF THE WORLD'S LARGEST!

200-ton LA CROSSE TRAILER for Boulder Dam.

We build a size for every load—fully reversible—pneumatic tires—meets the width and load restrictions of all states.

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Builders Building Chicago Ill.

A Wire Rope *Fundamental*

Every wire rope sold by Bucyrus-Erie Company is of *uniform high quality* throughout . . . constructed with greatest care by precision machinery and skilled workmen. But this is not the only safeguard you get when you buy rope from us.

Selection of the *proper* wire rope for the operating conditions to be encountered is *fundamental.*

In over 50 years' experience in building all types of excavating machinery, Bucyrus-Erie Company has gathered much valuable operating data on wire ropes. The advantage of this experience will be passed on to you when you send us your next wire rope order.

Always have an extra rope on hand . . . it may prevent a needless shutdown when continuous output is sorely needed.

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY
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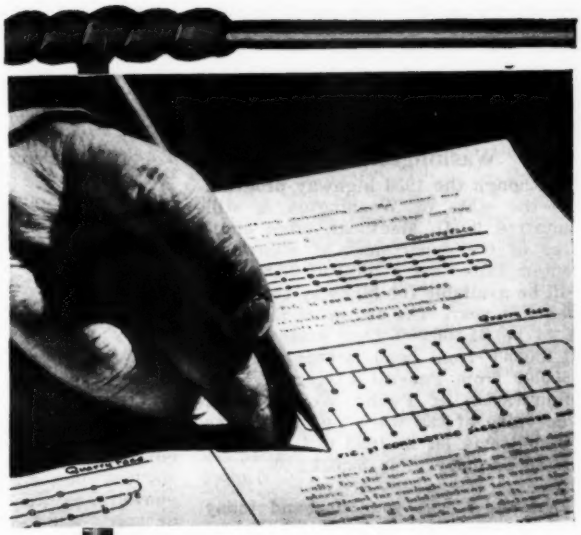
Yes! *it can be profitable to hook up jackhammer holes with* Cordeau--

Pass one end of the Cordeau-Bickford Detonating Fuse through a cartridge and drop to the bottom of the hole. Load and tamp. Connect each hole as shown by making wrap connections with the main lines of Cordeau, laid midway between the rows of holes. Cap the end of the main line with an EB Cap or Fuse Cap—and fire all the holes at one time. There is no limit to the number of holes that can be connected at one time.

Each load will have added force because every cartridge will be in contact with the detonating agent. This means more work from your explosives, better blasting. And the fact that Cordeau is an *insensitive* detonator, brings other important advantages.

Safety Fuse and Lighters

Ensign-Bickford Safety Fuse is available in a number of standardized brands, each carefully made for a particular set of conditions. The use of Safety Fuse simplifies blasting technique.

Also—there are a number of Ensign-Bickford Lighters, inexpensive—and positive in action.

The Ensign-Bickford Company,
Simsbury, Conn.

There is a new technique in blasting, which brings new economies to operators everywhere. It is explained and illustrated in the Cordeau Book — free to executives.

CB 28

CORDEAU DETONATING FUSE BICKFORD

For your convenience in writing to the advertisers on this page you will find a card bound in this issue.

Shots From the Firing Line—*Continued*

bridge over Meadow Valley Wash near Caliente $25,000.

Washington Notes

Although the 1934 highway program for the state of Washington is still tentative, J. D. MacVicar, office engineer of the department of highways, contemplates that a total of **$6,850,000 will be available for highway construction** this year. The source of this sum is to be $4,500,000 from state funds; $1,100,000 from bond issues; and $1,250,000 from Federal Emergency Administration of Public Works funds. The value of the work yet to be done on contracts let in 1933 and not completed January 1, is $2,031,240.

Friend—I met your husband today and he was telling me he is in love with his work.

Contractor's Wife—Is that so? I must drop around to his office and see about it.

Grand Coulee Notes

By KARL STOFFEL

Excellent weather combined with other almost ideal conditions have enabled subcontractors to get well ahead of schedule on the 2,100,000 yard Grand Coulee dam contract. On February 7, E. Paul Ford, General Superintendent for the David Ryan Construction Company of California, reported that with 23 percent of the 150 day time allotment used up, 29 per cent of the overburden had been moved. Three subcontractors, Goodfellow Brothers of Wenatchee, Rowland Construction Company of Seattle and M. S. Ross of Los Angeles, are moving 20,000 yards of rock and earth daily. They are running three six hour and forty minute shifts every 24 hours.

The overburden to be removed is equally divided on the east and west banks of the Columbia River. At present the work is being carried on in two schedules. Schedule No. 1, subcontracted by Goodfellow Brothers, is being handled with the following equipment; two P & H 1½-yard Diesel shovels; one Bucyrus-Erie E2 Diesel shovel; one Koehring 301 1-yard gas shovel; ten 8-yard International dump trucks; four White 5-yard dump trucks; one 80-Cletrac equipped with bulldozer; and one Caterpillar road maintainer.

Schedule No. 2 is using the following equipment: two Northwest 2-yard shovels, gas; thirteen Sterling 12-yard dump trucks; nine Auto Car 5-yard dump trucks; two Caterpillar 75 Diesel cats; two Le Tourneau 12-yard carryall scrapers; one 35 Cat equipped with McMillian hydraulic scraper; one 60 Cat; one 30 Cat equipped with a bulldozer.

Included in the 2,000,000 yards to be moved on both sides of the river is 40,000 yards of solid rock. Preliminary excavation for the $63,000,000 dam is going ahead with the 146-foot (above low water) low dam as the objective. About 10,000,000 yards will have to be moved for this structure. If, however, plans are changed to include foundations for a 370-foot dam as now seems likely, nearly 17,000,000 yards of excavation will be necessary. The type and height of the dam are now being studied by U. S. Reclamation engineers.

The unit construction plan calls for the low dam rising 146 feet above low water and 3,430 feet in length, requiring 2,000,000 yards of concrete weighing 3,000,000 tons. It will cost $63,000,000 and develop 250,000 K W prime power, 520,000 installed power and 700,000 installed H.P. The lake behind the dam will be 50 miles long and no irrigation will be provided.

The ultimate development either under this plan by later expansion or by direct construction of an original high dam will provide a structure 370 feet above low water, 4,290 feet in length, with 11,000,000 yards of concrete and costing $170,000,000. 900,000 K W prime power will be provided with 1,800,000 K W installed power and 2,400,000 installed H.P. The lake

Building a 40 Foot Fill

Raising this 40 foot fill on a railroad construction job, without the use of jacks—or the building of a trestle, is just one of the many instances where the Track Machine has been used at a great saving in time and labor. Disposing of overburden at quarries and mines, or any similar job where a track gang is maintained for shifting and raising, this machine and a few men will do the job quickly and soon pay for itself out of expense ordinarily required for men working with bars and jacks.

Made for Standard and Narrow Gauge Track.

NORDBERG MFG. CO., Milwaukee, Wis.

THE NORDBERG PATENTED
TRACK SHIFTER

DIETZ MOTOR TRUCK Flare kit

Kits Include Either 2 or 3 Torches

Various States now require that motor trucks carry Torch Flares for use in lighting the near vicinity in event of a breakdown on the road at night.

Dietz reliable Torches for this purpose are furnished with a metal container box, which attaches to the body of the truck, out of the way. Also sold separately. Two sizes: No. 55, Small, Burns 15 Hours; No. 80, Large, Burns 30 Hours.

Contractors can get double service out of these Torch Kits—meeting legal requirements as truck equipment and as an emergency supply for other road warning purposes.

R. E. DIETZ COMPANY
NEW YORK
Makers of Lanterns for the World Founded 1840

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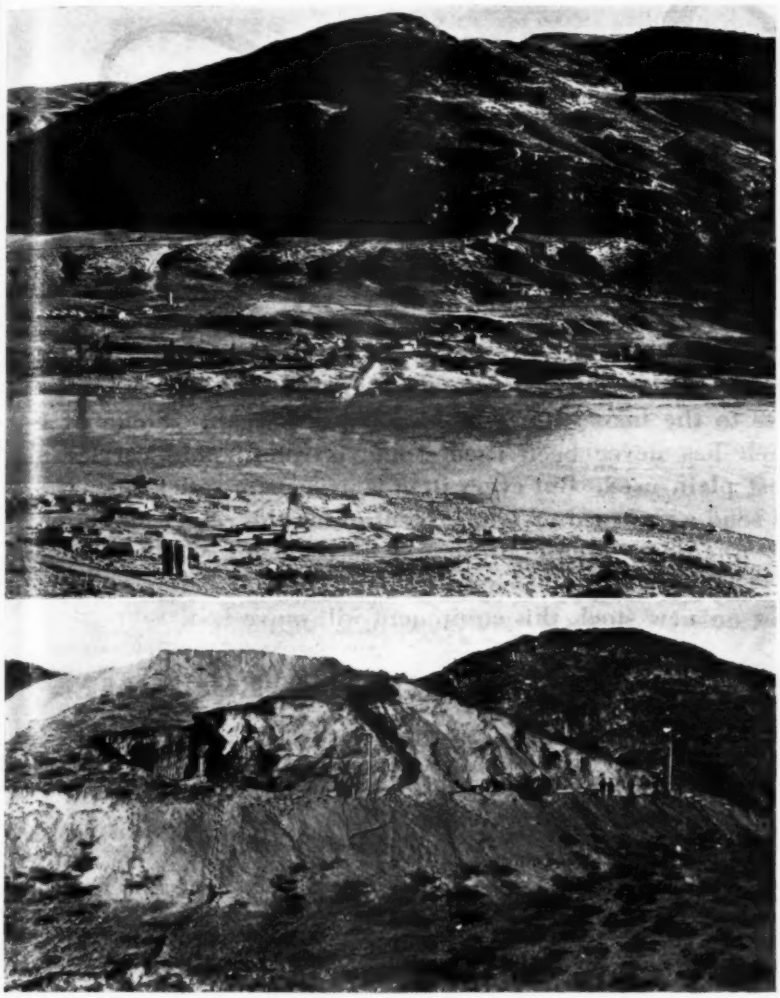

Above: The 370-foot Grand Coulee Dam in Eastern Washington will rise across this valley. In this picture you look across from the location of the west abutment. Excavation operations can been seen underway across the river at the foot of the granite peak against which the east end of the dam will rest. Below: Dirt moving operations where shovels and bulldozers are cutting into the base of the mountain. Huge floodlights illuminate the work at night so that work can continue 24 hours a day.

will be 151 miles long and will provide ample water for irrigation on reclamation projects. In either case the cost of power will be about 1.14 mills . . . possibly 1.25 mills from the low dam. Power will sell at the dam at 2.25 mills for prime power and .5 mills for secondary power.

Due to the fact that quite a large amount of the equipment being used is strange to the operators in this section of the country, and due further to the fact that all employees are obtained through the National Reemployment service, as near to the site of the operations as is possible, a large percentage of labor turnover has been necessary in order to select efficient and competent operators. Mr. Ford believes, however, that in a very short time operations will be up to a maximum of efficiency.

Bids for construction of both a cantilever type and suspension type bridge across the Columbia river to be located about 100 yards below the Grand Coulee dam-site, will be called for before this issue goes to press. Work on the job will start three weeks after the bids are let, J. L. Savage, Chief Designing Engineer of the Federal Reclamation service reports. The calling for bids on two types of bridges is a complete departure from original plans and is being done as an economy measure. The cost of the bridge has been estimated at $1,000,000. The contract will be let in two units, one the foundation and the other for the superstructure.

A 400-kilowatt Diesel power plant is being installed by **Three Engineers, Incorporated**, of Seattle, lighting contractors, at the dam-site. This plant will furnish light for excavation work as well as juice for the townsite of Grand Coulee, half a mile from the site.

A sample carload of gravel from a bed six miles up-stream from the Coulee dam-site is to be sent to the Denver reclamation office in the near future for tests. If it proves suitable for concrete in the dam, a tram or railroad will be built from the dam-site to the gravel bed.

Core drilling in the river bed at Grand Coulee was started this month by **Lynch Brothers** of Seattle, the drilling on either bank having been nearly completed. Water in the river ranges from 20 to 80 feet deep and the barge housing drilling equipment is anchored to a ferry cable suspended across the stream. Granite river bed and banks have been found excellent for anchorage purposes in drilling operations so far, Frank A. Banks, Chief of the Reclamation Engineers at the dam-site reports.

By GRACE KIRKPATRICK

The accompanying illustration shows preparatory work on construction of the giant **Grand Coulee dam**, for which $63,000,000 has been allocated. This particular piece of dirt moving is being handled by the **Rollins Construction Company**, sub-contracting for the David H. Ryan Company of San Diego. The dirt here is light and easy to move, and is being handled by Le Tourneau scrapers drawn by Caterpillar 75 Diesels.

Oregon Notes

R. I. Stuart & Sons of Medford with a bid of $4,381 were awarded the contract for 448 lineal feet of paving on the Oregon Coast Highway; **United Contracting Company** of Portland was awarded the contract for paving 2,580 lineal feet of the Oregon Coast Highway—Marshfield Section on a bid of $13,524; **Northwest Roads Company** of Portland with a bid of $34,827 was

SHOTS FROM THE FIRING LINE
(Continued on page 156)

Meeting Place of Capital and Labor

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HELP OF ALL KINDS FURNISHED FREE

EXCAVATING ENGINEER Bargain Counter

★ ★ ★ **THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.**

SHOVELS-CRANES DRAGLINES

P&H MODEL 208—45′ BOOM DRAGLINE Cats—15½′ long, 9′ wide, 22″ Treads. 100 HP. Waukesha High Alt. Engine. SCD-1.

AMERICAN 1 CU. YD. GASOLINE SHOVEL. Motor overhauled 1932. Good value. SCD-3.

P&H MODEL 600—40′ BOOM CLAMSHELL. Waukesha 75 HP. Engine. New 1929. Dragline and Shovel equipment also available. SCD-4.

P&H MODEL 600. New 1929. 20′ Boom, 14′3″ Dipper Handle, 1 cu. yd. Dipper. Waukesha 75 HP. Engine. Dragline and Clam Shell Equipment also available. SCD-7.

BUCYRUS-ERIE MODEL 30-B DIESEL—25′9″ Boom, 14′ Dipper Handle, 1 yd. Dipper. SCD-9.

MONIGHAN MODEL 1-W, WALKER — 60′ Boom Dragline, 1¼ cu. yd. Page Bucket. Good condition. SCD-13.

P&H MODEL 600—40′ BOOM DRAGLINE. Waukesha 75 HP. Engine. New 1929. Shovel and Clamshell Equipment also available. SCD-14.

KOEHRING MODEL 1—30′ Boom Gasoline Crane. Cat Mounted—No Bucket—4½″x5″ Wisconsin Engine. SCD-19

BUCYRUS-ERIE SLIGHTLY USED-LOADMASTER TRACTOR CRANE—14′ Boom—Rubber tired wheels—Rated lifting capacity 4500 lbs. McCormick-Deering Power Unit—New Machine Guarantee. SCD-17

Shovel Equipment

¾ CU. YD. DIPPER—23′ BOOM—15′ DIPPER HANDLE—Extra High Lift Rope Crowd Shovel Equipment suitable for Models 1030 or 1035. Brand New. SE-2.

¾ CU. YD. DIPPER—23′ BOOM and ENGINE —12′6″ DIPPER HANDLE—Shovel Equipment suitable for 20-B Steam. Brand New. SE-15.

COMPLETE FRONT END EQUIPMENT

¾ CU. YD. DIPPER—26′ BOOM and ENGINE —17′ DIPPER HANDLE—High Lift Shovel Equipment suitable for 30-B Steam. Brand New. SE-16.

¾ CU. YD. DIPPER—25′9″ BOOM—14′ DIPPER HANDLE—Shovel Equipment suitable for 30-B Diesel. Brand New. SE-17.

⅞ CU. YD. DIPPER—23′ BOOM—15′ DIPPER HANDLE—High Lift Rope Crowd Shovel Equipment Complete suitable for Model 1030 or 1035. Rebuilt—New Equipment Guarantee. SE-22.

⅞ CU. YD. DIPPER—21′9″ BOOM and ENGINE—15′ DIPPER HANDLE — High Lift Shovel Equipment. Suitable for 31-B Steam. Brand New. SE-18.

1 CU. YD. DIPPER—20′ BOOM—15′ DIPPER HANDLE — Rope Crowd Shovel Equipment, suitable for Osgood "Conqueror." Good mechanical condition. Low Price. SE-24

1 CU. YD. DIPPER—24′ BOOM—18′ DIPPER HANDLE—Slightly used but good conditioned. Suitable for any Bucyrus-Erie GA-2 or GA-3 Machine. SE-25.

1 CU. YD. DIPPER—24′ BOOM—16′ DIPPER HANDLE—Rebuilt and Guaranteed. Suitable for application Bucyrus-Erie GA2 or GA3 Machines. SE-26

1¼ CU. YD. DIPPER—22′6″ BOOM—16′ DIPPER HANDLE—Rebuilt and Guaranteed. Suitable for application Bucyrus-Erie GA2 or GA3 Machines. SE-27

1¼ CU. YD. DIPPER—25′ BOOM—17′ DIPPER HANDLE—Slightly Used Rope Crowd High Lift Shovel Equipment suitable for Model 37-B. New Machine Guarantee. SE-5.

1½ CU. YD. DIPPER—23′6″ BOOM—15′ DIPPER HANDLE—Slightly Used Rope Crowd Shovel Equipment suitable for Model 37-B. New Machine Guarantee. SE-6.

1½ CU. YD. DIPPER—27′ BOOM—17′ DIPPER HANDLE—High Lift Rope Crowd Shovel Equipment suitable only for Bucyrus-Erie 43-B machines. Rebuilt—New Equipment Guarantee. SE-23.

Dragline Equipment

35′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2. DL-2.

40′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2. DL-3.

40′ BOX BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2. DL-4.

45′ BOX BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2. DL-5.

40′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model E-2. **Brand New.** DL-6.

45′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model E-2. **Brand New.** DL-7.

40′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model 30-B Diesel. **Brand New.** DL-8.

45′ CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model 30-B Diesel. **Brand New.** DL-9.

BRAND NEW Ropes included with each of above Dragline Equipments.

All of above equipment is BRAND NEW and of BUCYRUS-ERIE manufacture.

Clamshell Equipment

40′ BOX BOOM CLAMSHELL EQUIPMENT INCLUDING ROPES. Suitable for Model D-2. **Brand New.** CS-3.

Trench Digging Equipment

¾ CU. YD—36″ WIDE SOLID TYPE DIPPER. 21′ Boom, and all auxiliary equipment for application to Model 1030. Will dig to maximum depth of 18′. DS-3.

BRAND NEW PAGE, two dippers each ⅝ cu. yd., one 38″ wide over cutters, the other 49½″ wide over cutters. 17′1½″ Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

BRAND NEW Ropes included with each of above Trench Digging Equipments.

DIPPERS

Small Machines

2 ⅝ CU. YD.—Plate.—Will fit 20-B Steam or Gas. Brand New. D-12

1 2/3 CU. YD.—Plate front.—Will fit 14-B. Brand New. D-13

1 ¾ CU. YD.—Rock type.—Will fit 30-B Gas or Diesel. Brand New. D-14

1 ¾ CU. YD.—Rock Type.—Will fit 20-B Steam or Gas. Brand New. D-15

4 ⅝ CU. YD.—Plate front.—Will fit 1030 or 1035. Brand New. D-16

1 ⅝ CU. YD.—Cast Front Inserted Tooth. Will fit 1030 or 1035. Brand New. D-17

2 ⅝ CU. YD.—Plate front.—Will fit 1030 or 1035. Brand New. D-18

1 ⅞ CU. YD.—Plate Front. Will fit 18-B. Brand New. D-20

1 ⅞ CU. YD.—Rock type. Will fit 31-B. Brand New. D-21

1 1 CU. YD.—Rock type. Will fit D-2 or 31-B. Slightly Used. D-22

2 1 CU. YD.—Cast Front Inserted Tooth Dippers. Rebuilt and Guaranteed. Suitable for application GA2 or GA3 Machines. D-34

1 1¼ CU. YD. INSERTED TOOTH. Will fit GA-2 or GA-3. Slightly Used. D-25.

1 1¼ CU. YD.—Cast Front Inserted Tooth Dipper. Rebuilt and Guaranteed. Suitable for application GA2 or GA3 Machines. D-35

1 1¼ CU. YD.—Plate front. Will fit E-2, 41-B or 42-B. Slightly Used. D-26

2 1¼ CU. YD.—PLATE FRONT. Will fit E-2. Brand New. D-27.

1 1½ CU. YD.—PLATE. Will fit E-2. Brand New. D-28.

2 1½ CU. YD.—Manganese Front Inserted Tooth. Will fit E-2, 41-B or 42-B. Slightly Used. D-29

1 1½ CU. YD.—Vanderhoef type with Vanderhoef teeth. Will fit E-2 or 42-B. Slightly Used. D-30

Large Machines

1 2½ CU. YD.—Front 2½" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Can be used on 68-C and 70-C machines. Brand New. D-1.

2 3 CU. YD.—Front 2½" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Can be used on Model 100-B, 68-C, 70-C Machines. Brand New. D-2.

1 3½ CU. YD.—Front 2¾" Nickel Chrome Steel, two part Van Port Reversible Teeth. Can be used on Model 88-C, 95-C, Class 180. Brand New. D-3.

1 4 CU. YD.—Front 2¾" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Has seen some service but in good condition. Can be used on Model 100-C, 120-B. D-4.

1 4½ CU. YD.—Lip 2¼" Manganese Steel, two part Reversible Manganese Teeth. Can be used on Model 88-C, 110-C. Brand New. D-5.

3 6 CU. YD. Molybdenum Steel Front, Annealed Cast Steel Back, two part Reversible Van Port Teeth. Can be used on 225-B and 320-B. Brand New. D-11.

1 8 CU. YD.—Front Molybdenum Steel, two part Van Port Reversible Teeth. Can be used on Model 320-B. Slightly Used but excellent condition. D-6.

DRAGLINE BUCKETS

BRAND NEW

2 ¾ CU. YD. PAGE CLASS "C." Approximate weight each 2425 lbs. DB-1

2 1 CU. YD. PAGE CLASS "C." Approximate weight each 3460 lbs. DB-2

1 1½ CU. YD. PAGE CLASS "C." Approximate weight 4540 lbs. DB-3

3 2 CU. YD. PAGE CLASS "C." Approximate weight each 5630 lbs. DB-4

1 2 CU. YD. OMAHA STANDARD. Approximate weight 4300 lbs. DB-5

REBUILT

1 1¾ CU. YD. OMAHA STANDARD. Approximate weight 3800 lbs. DB-7

1 2 CU. YD. BUCYRUS-ERIE TYPE "U" RED ARCH. Approximate weight 3700 lbs. DB-8

1 2½ CU. YD. BUCYRUS-ERIE INSERTED TOOTH. Approximate weight 6500 lbs. DB-9

1 2½ CU. YD. OMAHA STANDARD. Approximate weight 5400 lbs. DB-10

BOILERS

BRAND NEW

Will Make That Old Shovel Work Like New.
Can Also Be Used for Miscellaneous Service.

Vertical Type

8 36"x82½"—26 H.P.—142 lb. Working Pressure. Mass. Std. Will fit Type A. B-1.

4 42"x88"—35 H.P.—144 lb. Working Pressure. Mass. Std. Will fit Type B Shovel. B-2.

1 44½"x88½" fitted with extended fire box for burning wood. Can be used for coal or coke. 37 H.P.—144 lb. Working Pressure. ASME Std. Can be installed on Type B Shovel. B-3.

1 46½"x88½"—37 H.P. 150 lb. Working Pressure. Special Wood Burning. Mass. Std. Will fit any B-2 or B-3 Machine. B-7.

1 46½"x88½"—37 H.P.—150 lb. Working Pressure. Mass. Std. Will fit B-2 or B-3. B-8.

3 46½x110"—40 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

1 54"x100"—41 H.P.—125 lb. Working Pressure. ASME Std. Will fit B-2 or B-3. B-11.

1 58"x7'9"—70 H.P.—150 lb. Working Pressure. Mass. Std. Will fit 42-B Machine. B-12.

Locomotive Type

3 44"x17'—75 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-13.

1 44"x18'—88 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 70-C B-14.

1 54"x9'7"—70 H.P.—125 lb. working pressure —ASME and Canadian standard. Will fit Model 50-B machine. B-15.

2 54"x11'3"—92 H.P.—125 lb. Working Pressure. ASME and Mass. Std. Will fit Model 50-B Machine. B-16.

ELECTRICAL EQUIPMENT

MOTOR—GENERAL ELECTRIC—3 phase, 25 cycle, 550 volt, 1500 RPM., 90 HP., BRAND NEW. EE-1.

50 KW MOTOR GENERATOR SET—GENERAL ELECTRIC—consisting of 3 phase, 60 cycle, 440 volt, 1170 RPM., 75 HP., Induction Motor connected to 50 KW, 250 volt, 1200 RPM., Generator, including suitable rheostat and compensator. BRAND NEW. EE-2.

COMPENSATOR—GENERAL ELECTRIC—75 HP., 2200 volt, 3 phase, 25 cycle, manual type. BRAND NEW. EE-3.

TRANSFORMER—GENERAL ELECTRIC — 5-KVA. 2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. BRAND NEW. EE-4.

GENERATOR — WESTINGHOUSE — 125 KW, 250 volts, 500 amperes. Direct Current. 440 RPM. Includes two outboard bearings. BRAND NEW. EE-5.

MOTORS (2) — GENERAL ELECTRIC — 21.5 H.P. 3 phase, 60 cycle, 440 volt, 900 RPM. Totally enclosed—ball bearing. BRAND NEW. EE-6.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure, A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M. — Overall dimensions: — Height 45"—Length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Brand New. AC-1.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2 BRAND NEW NON-REVERSIBLE ATLAS DIESEL ENGINES—4 cylinder, 7" bore x 8½" stroke, 75 HP at 600 RPM, 4 cycle, Vertical—valve in head type. Includes radiator, fan and air cleaners. DE-1.

2 BRAND NEW NON-REVERSIBLE ATLAS DIESEL ENGINES—5-cylinder, 9" bore x 10½" stroke, 150 HP at 450 RPM, 4 cycle, Vertical—valve in head type. Dust proof, Oil tight crank case and forced lubricating system. Full equipment. Also auxiliary air starting equipment. DE-2.

4 BRAND NEW NON-REVERSIBLE ATLAS DIESEL ENGINES—3-cylinder 6" bore x 8" stroke, 45 H.P. at 650 R.P.M., 4 cycle, Vertical—valve-in-head type. Includes radiator, fan and air cleaners. DE-5.

3 BRAND NEW NON-REVERSIBLE ATLAS DIESEL ENGINES—4-cylinder, 6" bore x 8" stroke, 60 HP. at 650 RPM. DE-6.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 HP at 400 RPM. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 HP at 400 RPM. 100 lb. Pressure. ME-3.

2 5"x5" reversible —25.6 HP at 400 RPM. 100 lb. Pressure. ME-4.

1 "LITTLE TUGGER" INGERSOLL RAND STEAM HOIST ENGINE No. 1-H-5-2½ H.P. ME-5.

PUMPS

1 NB—3 STAGE CENTRIFUGAL PUMP—2" suction and discharge — bronze impeller and shaft—capacity 100 gallons per minute at 240' head operating at 1720 RPM or 270' head at 1780 RPM. Now equipped for belt drive but can be operated by 15 HP Electric Motor. ME-6.